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Organization Learning: A Sociocognitive Model Of Strategic Management

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ORGANIZATION LEARNING:

A SOCIOCOGNITIVE MODEL OF STRATEGIC MANAGEMENT

by

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ABSTRACT

The traditional view of strategic management suggests that the performance of the organization is dependent upon the fit between its strategy and the internal and external environment. However, this rational-analytic view neglects the critical question of how organizations learn about their environment and then act on the knowledge/understanding. This dissertation develops a sociocognitive model of strategic management which is rooted in an organization learning paradigm. The sociocognitive model acts as a framework for identifying points of leverage to improve an organization's collective interpretation of the environment.

It is hypothesized that the ability to interpret complex, dynamic domains is likely to reside in a group of individuals with a high **potential level of interpretation**; that is, a group with diverse and complex schemas. **Integration** is, however, key to exploiting cognitive diversity within a group. Based on the level of potential interpretation and the degree of integration achieved by a group, four types of organization schema are proposed: Impoverished (low interpretation and integration), Contentious (high interpretation, low integration), Groupthink (low interpretation, high integration), and Productive (high interpretation and integration).

The model was applied to a debate in the strategic management literature: whether consensus on goals and/or means leads to better performance. The cognitive

perspective provides a different interpretation of consensus, suggesting that previous research has not distinguished among Impoverished, Groupthink and Productive schemas.

A total of 398 graduates and undergraduates, randomly assigned to 70 groups, participated in the week long Markstrat simulation. Cause maps were elicited from the respondents for the purpose of measuring schema complexity and view divergence.

The results of the study supported the importance of integration. As well, a high level of potential interpretation without integration (Contentious groups) was consistently associated with extremely poor performance, as expected. The results suggest that while Productive groups had a high level of performance, it was difficult for groups to integrate their high level of diversity and complexity. Moreover, failing to do so led to very poor performance, as found in the Contentious groups. Overall, the results provided strong support for the model and for the use of cause mapping techniques to measure cognitive diversity.

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INTRODUCTION

Evidence of organizational strategic blunders abounds. The failure of the major North American automobile manufacturers to respond to the demand for a smaller car is a case in point. Bower (1990) reviews the literature regarding the disastrous performance of the Big Three auto producers between 1975 and 1985, and concludes that "for many years, their strategies did not reflect either the changing demands of consumers or competitors' dramatic improvements. Equally important, they did not appreciate the critical relationship between the cheap, low-end part of the market and the benefits of cumulative experience to a well-organized, adaptive manufacturer" (p. 53). Daft and Huber (1987) identify a myriad of other companies who found themselves in crisis and ultimately failed. With the clarity of hindsight, managers ask themselves: How could it have happened? Why couldn't we see it coming?

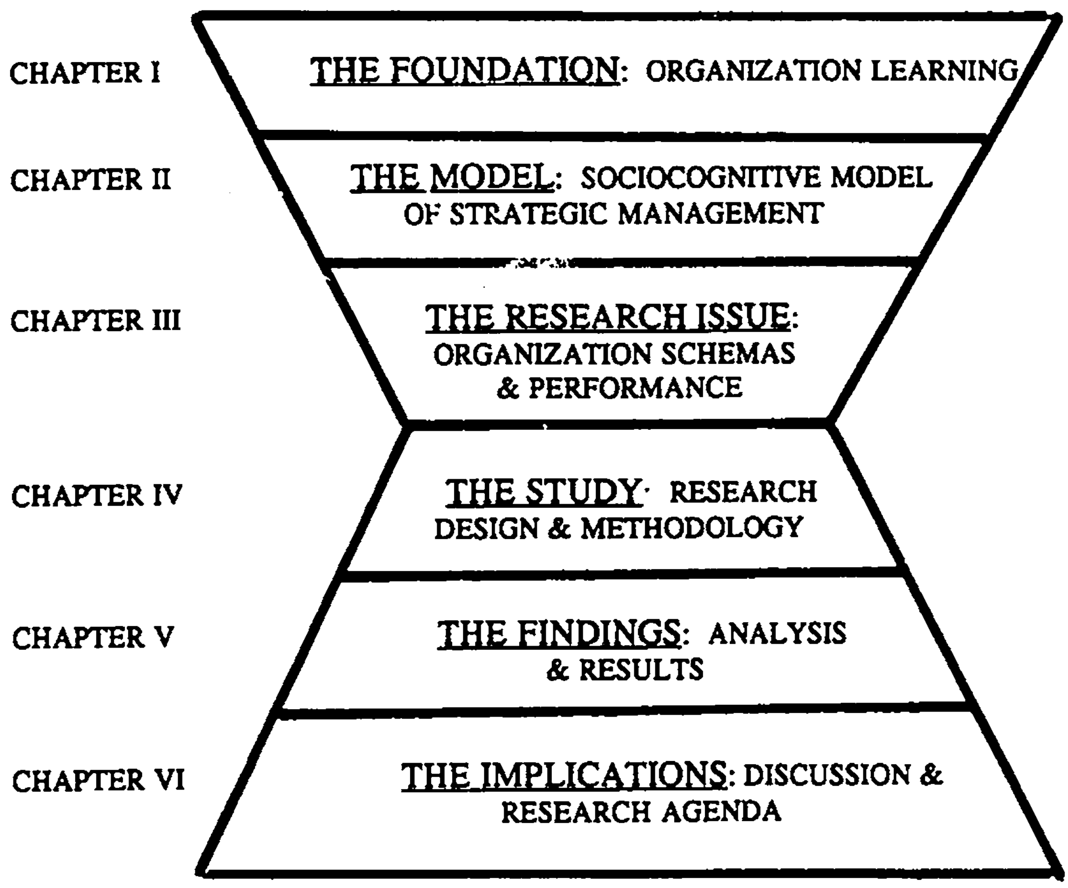
Conventional strategic management theory suggests that the performance of an organization is dependent upon the fit between the organization's strategy and its external and internal environment (Fiol and Lyles, 1985). This rational-analytic view explains strategic failure simply as a misfit. However, it oversimplifies the critical question of how fit arises and is sustained over time: **How do organizations learn about their environment and then act on this knowledge/understanding?** (Daft and Huber, 1987).

The phenomenon of organization learning is receiving an increasing amount of attention in the field of strategic management. Many have suggested that the only competitive advantage for firms is their ability to learn faster than their competitors (Garratt, 1987; DeGeus, 1988). However, while interest in the phenomenon has increased, there are no widely accepted models of organization learning to which researchers may refer (Shrivastava, 1983; Fiol and Lyles, 1985; Bedeian, 1986; Huber, 1991).

At the same time that organization learning has developed as a field of interest, the related area of organization cognition has also gained attention. Stubbart (1989), in an article entitled "Managerial Cognition: A Missing Link in Strategic Management Research", argues that "it is not realistic, wise or safe for the strategic management discipline to continue to ignore managerial cognition" (p. 326). While organization learning and organization cognition have had their separate followings, they are increasingly being melded together as researchers recognize the value of applying a cognitive perspective to organization learning.

The outline of this dissertation is graphically depicted in Figure 0.1. Chapter I, in which a conceptual approach to organization learning is proposed, is portrayed as being broad in scope since it delineates the theoretical foundation of this research. In Chapter II the focus narrows to examine organization cognition, as a sociocognitive model of strategic management is presented. The sociocognitive model acts as a framework for identifying points of leverage to improve an organization's collective interpretation of the environment. In Chapter III, the sociocognitive model is further developed and applied to an issue that has been debated in the strategic management literature for over a decade with no resolution: whether consensus on goals and/or means leads to better performance. The cognitive perspective expounded in this dissertation provides for a different interpretation of the meaning of consensus, thereby shedding new light on the consensus-performance issue.

FIGURE 0.1 DISSERTATION AGENDA



In Chapter IV the research design and methodology of the empirical portion of this dissertation are presented. Huff (1990) states that:

> We are at a point in strategic management and other organization sciences that significant enthusiasm for cognitive studies is in danger of outreaching its methodological foundation. (preface)

This dissertation aids in the formation of the methodological foundation through the development, testing and assessment of techniques that examine individual and group cognition. More specifically, this dissertation uses means-end analysis to elicit cause maps of individual schemas[1]. Cause maps of schemas are the depiction of the cause-effect web of beliefs that individuals hold about a particular domain. It is hypothesized that the ability to interpret complex, dynamic domains is most likely to reside in a group of individuals with a high **potential level of interpretation**; that is, a group with <u>diverse</u> and <u>complex</u> schemas. **Integration** is, however, key to exploiting cognitive diversity within a group. Based on the level of potential interpretation and the degree of integration achieved by a group, four types of organization schema are proposed: Impoverished, Contentious, Groupthink and Productive. The domain selected for this study is an interactive simulation called Markstrat.

The primary rationale for selecting the simulation is the balance it provides between the level of control, enhancing internal reliability, and the realistic nature of the

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[1] Consistent with Sims Gioia and Associates (1986) although the plural of *schema* from the Greek is *schemata*, the anglicized plural, *schemas* is used in this dissertation.

simulation, enhancing external validity. A total of 398 graduates and undergraduates, randomly assigned to 70 groups, participated in the week long simulation.

The analysis and findings of the study are reported in Chapter V. In Chapter VI, the findings are discussed and the limitations of the study are presented. As well, an agenda for future research is suggested.

In this dissertation, the sociocognitive model, which is rooted in an organization learning paradigm, extends the conventional notions of strategic management. In doing so, the theory presented ties together, and builds on management theory and research in the areas of organization learning and cognition, and further develops the theory by drawing on the literature from the disciplines of Psychology, Sociology and Philosophy. The uniqueness of the sociocognitive model and the methodology, as well as the diversity of the fields on which they draw, suggest a different presentation. Rather than following the traditional format of a review of the literature followed by a discussion of the theory, this dissertation will develop the theory incrementally , while weaving theory and the literature together, as the theory is developed in an incremental fashion. This approach will enable the reader to grasp the nuances of the theory, and its link to the various literatures on which it draws.

This dissertation responds to the call by many researchers for a cognitive approach to the study of strategic management. Furthermore, the sociocognitive perspective is built on a solid foundation, since it is rooted in an organization learning paradigm. The application of the model to the consensus-performance issue demonstrates the utility of applying a cognitive perspective to issues in strategic management. In addition, this dissertation aids in the development of the methodology for studying cognition through the measurement and analysis of cause maps. Finally, the results of the study provide useful insights to managers about the relationship between the diversity and complexity of views of a management group about key relationships (interpretation), the integration of those views, and the performance of the group with respect to making effective strategic decisions.

CHAPTER I

THE FOUNDATION: ORGANIZATION LEARNING

> The literature on organizational learning is in an early stage of development. Although growing, the number of empirical studies dealing with organizational learning is quite small. Consequently, there is virtually no consensus as to what and how organizations learn.
> (Bedeian, 1986; p. 193)

These sentiments have been echoed by other theorists who have attempted to grapple with the phenomenon of organization learning (Shrivastava, 1983; Fiol and Lyles, 1985; Huber, 1991). This chapter presents a concept of organization learning which forms the foundation for the sociocognitive model of strategic management presented in Chapter II.

Developing a concept of organization learning is important for several reasons. At the broadest level, organization learning is about how organizations change, a vital process for the vast majority of organizations if they are to survive and prosper. Organization learning, however, is not simply about the management of change, an already well-established field of study. It is about the basic elements and processes by which organizations develop and grow. Growth, not in the physical sense of increased assets or sales, but growth in knowledge or understanding of the organization, its environment, and the relationship between the two. Huber (1991) states that "organizational adaption and innovation, both critical in a rapidly changing world, could undoubtedly be improved if organizational designers and administrators knew more about how organizations learn and about how organizations might be guided to learn more effectively" (p. 108).

The concept of organization learning proposed in this chapter focuses on the basic elements of organization learning by responding to three fundamental questions: What is learning? What is organization? and What is organization learning?

WHAT IS LEARNING?

Although it will be argued that organization learning is different than the summation of what individuals in the organization have learnt, it will also be argued that understanding individual learning is a necessary prerequisite to understanding organization learning. While theories of individual learning are far more developed than theories of organization learning, a great deal of contention exists within the field of individual learning as well. However, this dissertation will not review the voluminous literature on individual learning. Rather, this dissertation draws on the theories of individual learning to develop basic precepts that form the theoretical underpinnings to examine organization learning. The following section proposes and subsequently elaborates on three precepts underlying the phenomenon of individual learning.

1) Learning should be understood as a phenomenon involving both change in **beliefs (cognition)** and change in **behaviors (actions)**. The results of a change in beliefs and behaviors is referred to here as the **product** of the learning process.

2) The process of learning should be conceived of as a dynamic interplay among beliefs, behaviors and stimuli from the environment, where beliefs are both an input and a product of the process as they undergo change.

3) The effectiveness of learning should be assessed on the basis of its utility in guiding behavior relative to a particular domain.

Each of the precepts will be addressed in turn, beginning with a discussion of the products of the learning process: changes in behavior and changes in cognition.

Products of the Learning Process

In "everyday parlance", when we refer to learning, we generally refer to the product of the learning process. Product refers to changes in beliefs (also referred to as cognition): "I learned that cats are smaller than dogs."; and changes in behavior: "I learned how to catch a ball." The term "skill" is often used to describe behaviors for which an individual has developed a level of expertise or proficiency.

In the field of individual learning theory there is a long history of debate about whether learning involves changes in cognition and/or changes in behavior (Mazur, 1990). The debate has evolved into separate schools of thought, generating cognitive theories about learning and behavioral theories about learning (Claxton, 1984). Leahey and Harris (1985) distill and categorize the controversy over learning as arising from the dispute over three questions: 1) Should learning be studied through introspection or inference?; 2) Is learning the result of nature or nurture?; and, 3) Is the mind passive or active in the learning process?

The inference approach has been adopted by behaviorists who reject the study of the mind as being unscientific. Instead, they focus on studying observable behavior to infer what is going on in the mind. In fact, the pure behaviorists, such as B.F. Skinner, have argued that unobservable events have no place in psychological theories (Mazur, 1990). From the behaviorist perspective there are three primary types of learning: 1) Classical conditioning which is characterized by the work of Ivan Pavlov, examines the relationship between a variety of stimuli and changes in reflexive responses; 2) Operant conditioning, which is most closely associated with the work of B. F. Skinner, examines the relationship between a variety of stimuli and changes in unreflexive responses, given various schedules of positive reinforcement (reward) and negative reinforcement (punishment); and 3) Latent learning which was introduced by Edward Tolman, advocates that learning (changes in non-reflexive) responses occurs without reinforcement. In contrast to the behaviorists' focus on observable behavior, cognitive theorists have focused on processes that are not directly observable such as short-term memory, long-term memory, sensory information storage, attention and rehearsal (Mazur, 1990).

In terms of the nature/nurture argument, proponents of the role of nature argue that individuals have an innate potential that is waiting to be unleashed, while proponents of the role of nurture argue that individuals are born with a "blank slate" that is waiting to be written upon. There is no direct correspondence between cognitive theorists and behaviorists on the one hand, and their espousal of either nature or nurture on the other. However, behaviorists are more closely aligned with the nurture argument, and cognitive theorists, such as Carl Jung, have suggested that individuals have innate preferences for different modes of information gathering and evaluation.

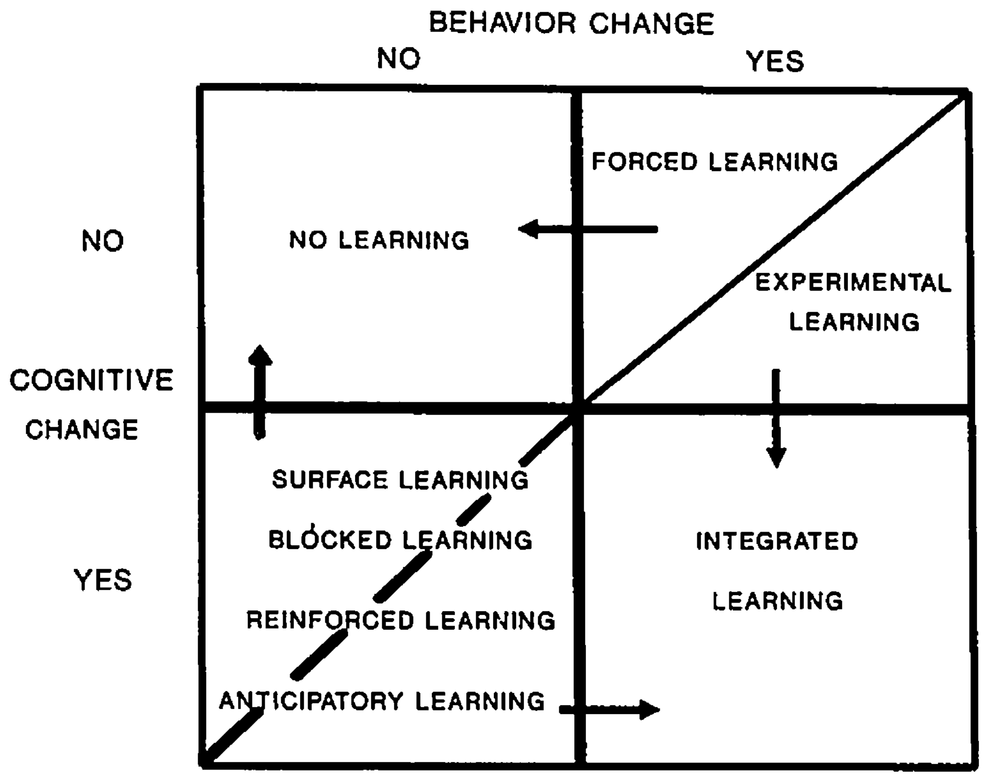
A third area of contention between cognitive theorists and behaviorists is whether the mind plays an active or passive role in learning. Hamlyn (1983) argues that, although cognitive theorists focus on the mind while behaviorists often discount the value of studying the mind at all, cognitive theorists have not necessarily adopted an active approach to the involvement of the mind in learning. The distinction can be made between the physiological activity of the mind associated with the processing of information and the degree to which an individual's belief system actively constructs meaning in the process of interpreting stimuli.

The foregoing discussion has focused on the distinction between cognitive theorists and behaviorists. However, Claxton (1984) proposes two other categories of learning theory: social personality theories and humanistic theories. He neatly labels the four types of theories as: "head" for cognitive theories; "hands" for behavioral theories; "heart" for social and personality theories; and "hara" for the "gut-feel" of humanistic theories. This dissertation makes no distinction among Claxton's categories of head, heart, and hara, since cognition is broadly defined to encompass knowledge, beliefs, opinions, attitudes and feelings. Although some theorists, such as Abelson (1979), make useful distinctions among many of these elements, Festinger (1957) points out that knowledge, beliefs, attitudes and opinions are all elements of cognition. Furthermore, since individuals do not ordinarily compartmentalize and isolate each element as either a belief or an attitude, for example, it is more important from a cognitive perspective to focus on their similarities than on their differences. Therefore, the terms cognition, beliefs and knowledge are used interchangeably in this discussion to refer to the web of beliefs, both conscious and unconscious, that ultimately guide action. Rather than trying to distinguish among different types of beliefs, this dissertation argues for the need to forge some links between beliefs of all types, and behaviors, as discussed below.

Relationship Between Cognition and Behavior

While learning theorists continue to debate the relative merits of cognition over behavior (Mazur, 1990), this dissertation advocates that cognition and behavior are so tightly intertwined that it is counter-productive to define learning as being simply a change in one or the other. Rather than trying to pinpoint learning as being a particular state of cognitive or behavioral change, it is suggested that different types of learning can be distinguished based on whether there is cognitive and/or behavioral change, as shown in Figure 1.1. There will be little dispute that where there is no cognitive change and no behavioral change, there is **no learning**. Conversely, where there is change in both, learning has occurred, a state referred to in Figure 1.1 as **integrated learning.**

FIGURE 1.1 RELATIONSHIP BETWEEN COGNITION AND BEHAVIOR



This dissertation suggests that change in behavior without the corresponding change in cognition, or change in cognition without the corresponding change in behavior, are transitional states since they result in a tension between one's beliefs and one's actions. The tension, however, is a cognitive tension between one's interpretation of one's behaviors and other beliefs. Festinger (1957) refers to this tension as "cognitive dissonance". Festinger supports the transitional nature of the tension in his statement that "reduction of dissonance is a basic process in humans" (p. 4). The transitional nature of the tensions is also supported by Heider's (1958) balance theory. Heider states that "an analysis of the phenomenal properties of balance and imbalance as well as the experimental evidence relating to them supports the generalization that states of balance tend to be preferred over disharmony" (p. 204).

Change in behavior without any change in cognition may be resolved in several ways. This dissertation suggests that if the behavioral change arises from **forced learning** it will likely resolve itself into the no learning quadrant. Individuals will continue to interpret stimuli through their current belief systems, hence reinforcing existing beliefs. For example, individuals who feel forced to comply with governmental environmental standards may change their behaviors to comply with the standards; yet, in doing so, they reinforce their views that government should not be intervening in their affairs. However, if it is **experimental learning**, individuals may try out new behaviors as a test that may result in cognitive change, in which case they will move into the integrated learning quadrant. A key aspect of experimental learning is that individuals are willing to suspend their belief systems to try a new behavior, and in doing so are open to new and different interpretations of the results of the behavior.

The foregoing discussion has painted a fairly simplistic picture of how a transitional state, where behavioral change not accompanied by cognitive change, is resolved. The reader should be cautioned that the model and discussion are designed to provide insight into the relationship between cognition and behavior, rather than any definitive statements about how and why the change occurs. For example, Schein (1971), has devoted an entire book to describing how and why American civilians held by the Chinese communists between 1950 and 1956 changed or failed to change their beliefs as a result of the treatment they received. A further example is the work of the well-known behavioral theorist, B.F. Skinner, who has contributed a wealth of theory about how different schedules of reinforcement are used to change behavior.

The other transitional state occurs when individuals experience cognitive change without any behavioral change. The simplest case can be referred to as **anticipatory learning:** a gap between the time when the individual experiences a change in cognition and the time when he or she has the opportunity to exhibit a change in behavior. For example, many years of medical education are required before a physician can attempt the first operation. Nonetheless, it is the changes in cognition arising from medical education which guide the the surgeon in the behavior required to perform that operation.

The more difficult cases are those in which individuals have undergone changes in cognition which, for some reason, are not reflected in their behavior and may likely never be reflected in their behavior. Often this situation is associated with a physical skill such as playing golf or running. Although the individuals may have experienced changes in cognition so that they "know" what they are supposed to do, they are not able to execute that know-how. While individuals may know how to run the 100 metre sprint, they are unlikely to beat Carl Lewis or Ben Johnson. These examples raise the issue of the link between resources and learning. In the case of the 100 metre sprint, an individual who does not possess the same "fast-twitch muscles" as Ben Johnson, also does not possess the resources to perform as Ben Johnson.

There are other cases in which a change in cognition does not lead to a change in behavior. **Blocked learning** occurs when other beliefs override the situation. For example: "I may know that it's not right to steal, but I need to feed my family"; "I know that I should participate in class, but I am afraid to talk in a large group"; "I know that the customer is always right, but I can't take this kind of abuse." In order to see the learning manifested in behavior, it is necessary to deal with the blocking element. For example, customer representatives might treat customers better if they did not have to deal with the extreme abuse they received from customers irate over shoddy products or service.

Blocked learning is difficult to distinguish from **surface learning**, where individuals change their cognition to reflect what they "should" believe. They are often good at articulating the belief; however because it is not deeply rooted in their belief system, it is easily blocked by competing beliefs. The "closet racists" may fall into this camp. They openly articulate non-racist sentiments, but their actions indicate otherwise.

A final type of cognitive change which may not result in behavioral change is **reinforced learning,** whereby individuals' belief systems change as a result of strengthening specific relationships that further support their current behaviors. For example, motorists who exhibit no behavioral change, given that they consistently stop at red lights, may exhibit cognitive change as their belief that they should stop at red lights is strengthened and reinforced over time by observing a variety of occurrences: other people who stop at red lights; police who ticket those who do not; the tragic consequences of traffic accidents for those who do not.

The foregoing discussion argues that a concept of learning should encompass changes in cognition and changes in behavior. It is suggested that the two are tightly interwoven, with either one preceding the other under different circumstances. If learning is defined as either one or the other, important aspects of learning may be overlooked simply because they are separated in time. However, a change in one without a change in the other creates a state of tension, known as "cognitive dissonance". The tension suggests that the state is transitional, requiring a resolution through a corresponding change in either cognition or behavior.

The relationship between cognitive change and behavioral change focuses on the products of the learning process rather than on the process of learning. The following discussion elaborates on the second precept, which suggests that learning should be viewed as a dynamic interplay among beliefs, behaviors and stimuli from the environment, where beliefs are both an input and a product of the process as they undergo change.

Learning Process

Since the thrust of this dissertation is to examine cognition rather than behaviors, the following discussion will focus on how changes in cognition arise. It was suggested that in the transitional state of experimental learning, behavioral change may result in cognitive change; and in anticipatory learning, for example, cognitive change precedes behavioral change. However, the discussion did not address how the change in cognition arises.

It is suggested that cognitive change arises when: 1) individuals "detect" a mismatch between their beliefs and their perception of the stimuli they encounter; and 2) they modify their beliefs to resolve the discrepancy. Perhaps the most salient cases of changes in cognition are evidenced by the learning of a child. For example, a child may have a belief system that suggests that cats are furry and have four legs. The child then encounters a dog (stimulus) and calls it a cat since it is furry and has four legs. An adult tells the child that it is not a cat but a dog. The child is puzzled. There is a discrepancy between the child's belief and the stimulus. If the discrepancy remains unresolved, the child has not learned. However, the child may compare the memory of other cats with the mental image of the dog, and conclude that what differentiates the animals is the dog's larger size. The child's belief about cats is then modified to include smallness in the description. Further opportunity for modification may occur when the child encounters a small dog.

The identification of a discrepancy may be experienced as a gap, in which case the individual has no expectations regarding a particular stimulus, or as a conflict, in which case there is a conflict between what one expects and what one experiences. A gap arises when individuals experience something for which they have no corresponding beliefs. For example, the child's first experience with a pair of scissors may occur after several opportunities to use them, if the child did not process the stimuli on the previous occasions. The primary reason for not processing the stimuli is not noting them. Weick (1979) refers to this "bracketing of some portion of a stream of experience for further attention" (p. 45) as "enactment". Weick uses the term "selection" to describe the process of interpreting the experience, and "retention" as the storage of the interpretation guiding further applications. Therefore, the scissors may have been around the house, but were not the first item to catch the child's attention. They were not enacted. Perhaps it was the cat that was soft, furry, and alive, or the crayons that made colours which caught the child's attention. However, after the scissors had been noted, a gap existed between the new object and the beliefs about the object. Although learning may not occur if the gap remains unresolved, it is likely that some modification, such as noticing that the object is sharp, will occur.

Piaget (1976) refers to the resolution of a gap as the process of assimilation, and the resolution of a conflict as the process of accommodation. He suggests that the latter is more difficult than the former, since accomodation requires the individual to replace an existing belief system with new beliefs, rather than just adding beliefs as occurs in assimilation. Adams (1986) states that "the mind tends to reinforce what is already there" (p. 17). As a result, individuals face perceptual blocks in interpreting familiar stimuli in new ways.

While it has been suggested that the primary reason for not processing stimuli is not noting them, one of the primary reasons for not noting them is not having a belief system about them.

> There is a dialectical contradiction between these two requirements: we cannot perceive unless we anticipate but we must not see only what we anticipate...Although a perceiver always has at least some (more or less specific) anticipation before he begins to pick up information about a given object, they can be corrected as well as sharpened in the course of looking...The upshot of the argument is that perception is directed by expectations but not controlled by them. (Neisser, 1976; p. 43)

Neisser's comments demonstrate how beliefs both guide and are a product of the learning process. Although beliefs guide what is enacted and interpreted, Neisser suggests that they do not control the process; hence, there is opportunity to interpret stimuli that may alter one's beliefs.

As an input to the process of learning, a highly developed belief system with many concepts and interrelationships enables an individual to make subtle distinctions, and therefore, to notice differences others miss. The ability to discriminate sets experts apart from novices. Walk (1978) recounts a story by Root (1974) about wine tasting:

> The competing sommeliers were called upon to identify 14 different vintages. It turned out that all 14 were the same wine of the same year; the contest boiled down, therefore, to naming the *clos*, the individual plot of land on which each wine has been grown, some of them only a few acres apart. All of the contestants realized that they were faced with 14 wines of the same category, and named correctly the wine and the year. The winner identified the 14 *clos* correctly, two others were right on thirteen. (p. 259)

In summary, the process of learning is a dynamic interplay among beliefs, behaviors and stimuli from the environment. Beliefs both guide and are a product of the learning process. They guide the process through the identification of gaps and conflicts, and are a product of the process as the gaps and conflicts are resolved. Whether the resolution of the gap or conflict is necessarily positive is the subject of the third precept of individual learning.

Evaluating Learning

Is learning necessarily positive? The difficulty with this question is that to judge whether something is positive or negative, good or bad, right or wrong, someone must "know" the objective reality. As will be discussed in Chapter II, the assumption that there is an objective reality that individuals know has been the premise of many strategic management researchers. Unfortunately, there are few instances in which this assumption holds, and therefore obtaining an assessment of learning is problematic. Furthermore, even in cases where one might argue that there is an objective reality that is known, assessing whether learning has occurred is still problematic since there are many states of learning. For example, in the case of the child who learned that cats are smaller than dogs, the reader may have thought the knowledge gained was incorrect, because cats are not always smaller than dogs. Are we to conclude, therefore, that the child did not learn since what was learned was wrong, even though the child discovered something that will help in discriminating between cats and dogs? This dissertation suggests that the assessment of whether learning has occurred cannot be tied to evaluations of right or wrong. Rather, it is suggested that learning should be evaluated relative to the utility it provides individuals to function in a particular domain.

De Bono (1976) states that:

> all the psychological and physiological evidence that we have suggests that with regard to perception, the human mind is a pattern-making and pattern-using system" (p. 87). "Pattern is the basis not only of how the mind works, but of how the world itself works (p.78).

From De Bono's perspective, effective learning involves developing the mental patterns that allow an individual to function in a particular domain. De Bono argues that most errors in decision-making are errors of perception rather than errors of logic, suggesting that individuals are not able to discern the stimuli in the environment, or the patterns that are relevant to the decision. Festinger (1957) argues that the domain in which an individual operates "exerts pressures in the direction of bringing the appropriate cognitive elements into correspondence with that reality" (p. 11).

Given the arguments of De Bono and Festinger, the notion that performance arises from a high degree of cognitive correspondence with reality is appealing. It follows that learning or changes in cognition should be associated with greater cognitive correspondence with reality, and therefore with better performance. However, the use of cognitive correspondence as a predictor of performance, or as a yardstick for evaluating learning, is fraught with difficulties. Perhaps the greatest problem is identifying the relevant patterns of reality that bear upon a particular decision or action. As well, a weak correspondence with reality may yield high performance in a benign environment, thereby providing more information about the environment than whether an individual has learned effectively. Furthermore, poor performance can be very misleading; for example, when athletes learn a new technique which initially hinders their performance but eventually enables them to excel. Essentially, the individual moves to a new learning curve offering the potential for greater improvement, yet requiring some setbacks to make the move to the new curve. Performance based measures run into difficulties when the change and the benefits of the change are separated in time.

Identifying at what point change actually occurs is a difficult prospect. It is like the farmer who tried to remove a giant stone from the field by breaking it up with a sledge hammer. After 40 attempts, the stone did not break. With 40 more attempts, and a great deal of sweat, the stone would not break. Finally with the one hundredth blow, the stone shattered. Although the stone clearly shattered on the one hundredth blow, with every blow the rock was undergoing transformation, perhaps imperceptible to the human eye, yet essential for the final visible transformation to occur. So too with learning: many subtle, incremental changes may occur which contribute to the more apparent change.

This is not to say that performance does not provide valuable feedback. However, the performance itself requires interpretation, and there are many intervening factors affecting performance that may mask whether or not learning is actually occurring. Therefore, this dissertation suggests that determining whether learning has occurred should not be tied to a performance based measure. The evaluation of learning should be based upon the utility it provides an individual to function in a particular domain.

In summary, the foregoing discussion has proposed and elaborated three precepts of learning. The first precept drew on the cognitive and behaviorist theories of learning to propose that learning encompasses both changes in beliefs (cognition) and changes in behaviors. The second precept argued that the process of learning is a dynamic interplay among beliefs, behaviors and stimuli from the environment where beliefs guide the process of identifying gaps and conflicts. As well, beliefs are a product of the process as they undergo modification during the resolution of the gaps or conflicts. The third precept indicated that learning involves change which should be evaluated based on the utility it provides an individual to function in a particular domain.

WHAT IS ORGANIZATION?

To move from individual to organization learning requires the development of a concept of organization. Barnard (1938), one of the earliest contributors to a theory of organization, suggests that an organization is a system of consciously coordinated activities of two or more people. Barnard's concept of organization is that the specialization and division of labour among individuals gives rise to organizations. However, he recognizes that communication among the various parts or individuals in the organization is essential to coordinate activities. While Barnard focuses on the division of labour, Weick (1979) builds on Barnard's concept of organization by recognizing the role individuals play, but also suggesting that the pattern of interactions among individuals is the essence of organizations. Furthermore, he states that organizations may outlast their originators, suggesting that organizations are "something more" than just a collection of individuals. To develop a concept of organization as "something more" than its individual members, organization theorists have drawn on a variety of metaphors.

Morgan (1986) describes organizations as machines, organisms, brains, cultures, political systems, psychic prisons, flux and transformation, and instruments of domination. Gray, Bougon and Donnellon (1985) suggest that organizations are constructions and destructions of meaning, while Quinn and Cameron (1988) suggest paradox and transformation as an additional metaphor. Morgan concludes that no one metaphor captures the essence of organizations, and advocates, therefore, that theorists should use a variety of metaphors to describe organizations.

In support of Morgan, this dissertation recognizes the value of applying multiple metaphors to understanding organizations: like machines, organizations need to be efficient; like organisms, organizations are open systems that interact with the environment, and whose survival is dependent upon their exchange relationship with the environment; like brains, organizations are systems of communication and information processing with the ability to self-organize and learn; like cultures, organizations are socially constructed systems of shared meaning in which symbolism is important; like political systems, organizations are systems of conflict and power where activity is interest based; like psychic prisons, organizations can imprison their members in the psychic shared beliefs of conscious and unconscious processes; like flux, transformation and paradox, organizations are systems of tension and intricate connections that create complex causal loops. These various metaphors are viewed as complementary rather than conflicting since they facilitate viewing organizations from multiple perspectives. Much like the three blind men describing different parts of an elephant, the metaphors aid in showing different parts of the complex phenomenon of organizations.

While the metaphors provide a broad perspective of organization, the perspective can be distilled to emphasize aspects of organization that are critical to understanding the links between individual and organization learning. In this regard, this dissertation's concept of organization as it applies to organization learning is most closely associated with Morgan's brain and culture metaphors. The brain metaphor emphasizes the importance of cognition, while the culture metaphor suggests that organizations are systems of shared meaning. In support of Barnard, the focus on shared meaning recognizes the central role of individuals in organizations. However, the role of individuals is not simply viewed as one in which tasks and responsibilities are distributed and coordinated amongst the individuals. Such a view portrays individuals in a passive manner from a cognitive perspective, but active from a behavioral standpoint. Rather, in this dissertation, individuals are viewed as playing an active role in the construction of meaning, as advocated by Weick. Furthermore, while shared meaning may be manifested in coordinated activities and the shared beliefs of the individual members of the organization, there is "something more" to organizations than just its individual members, as suggested by Weick. Therefore, shared meanings may be created, sustained and manifested in the systems and structures of the organization that endure long after individuals have left. It is this last point that often differentiates among various theories of organization learning.

Theorists have differing views on the importance of systems and structures as store houses of shared meaning, as exemplified by the comments of Walsh and Ungson

(1991) about the concept of organization memory:

> Researchers disagree on the specific form of organizational memory and on what level it might reside in the organization. Opinions range from Argyris and Schon (1978: 136), who argued that organizational memory is only a metaphor (i.e., "organizations do not literally remember"), to Sandelands and Stablein (1987: 136), who raised the possibility that "organizations are mental entities capable of thought." (p. 59)

Walsh and Ungson argue that information used to guide behavior is stored in the systems and structures of organizations. They state, for example, that "rules represent formal and informal codifications of 'correct' behavior that is conditioned by consensual agreement among the participants" (p. 66).

The following discussion of organization learning elaborates on the earlier discussion of individual learning given the concept of organization presented.

WHAT IS ORGANIZATION LEARNING?

This section focuses on the broad theories of organization learning that represent the general theoretical foundation on which more specific theories about learning have been, or could be based. As Huber (1991) points out, many theorists have developed specific theories about organization learning with little regard for the broad theoretical underpinnings on which theories of organization learning must draw. For example, a limited view of organization learning is advocated by Lant and Mezias (1990) who write that:

> An organization learning model has three basic components. First, organizations have a target level of performance or aspiration level to which they compare their actual performance...Second, performance above or below aspiration level affects the likelihood of observable organizational change because performance relative to aspiration levels defines the organization's perceptions of success and failure. Third, unlike the typical firms of neoclassical economics, which instantaneously scan large numbers of alternatives, a learning model suggests that the acquisition and processing of information about alternatives takes place in a relatively costly process of search. (p. 149)

There is clearly a continuum of research employing an organization learning perspective, with varying degrees of theoretical links to the fundamental issues of organization learning as they are presented in this chapter. It is laudable that researchers are trying to apply the concept of organization learning to particular issues, and furthermore, to operationalize the concept to test theories. Nevertheless, their efforts may be misguided, not because they will fail to generate useful insights from their research, but because they may be shortchanging the insight that might have been gained, if they had tapped into the theoretical root system that has developed around organization learning.

Huber (1991) provides an excellent assessment of the organization learning literature, concluding that organization learning theorists were not building on the work of each other, let alone assessing other fields that provide insight into organization learning. He states that "there is little in the way of substantiated theory concerning organizational learning and there is considerable need and opportunity to fill in the many gaps" (p. 107). Furthermore, he states that "with very few exceptions, work on organizational learning has not led to research-based guidelines for increasing the effectiveness of organizational learning" (p. 108). Huber also suggests that the lack of development and cohesiveness of the literature are inter-related, since researchers have difficulty finding common ground in a field that is sparsely populated. The difficulty of finding common ground is further aggravated by the lack of agreement on what organization learning is, how it occurs, and how it should be assessed. Furthermore, it is this researcher's experience that the literature on which organizational learning theorists can draw is far-reaching and complex, requiring a level of understanding and expertise beyond that which exists in most individuals. There is a dual risk of either getting stuck in the quagmire, or of avoiding the quagmire, thereby dealing with organization learning at only a superficial level.

This chapter wades into the quagmire, to elucidate the major areas of disagreement or consternation for organization learning theorists which include: 1) the relationship between individual and organization learning; 2) whether learning refers to products and/or processes; 3) whether learning refers to cognitive and/or behavioral change and how the two inter-relate; and 4) whether learning should be tied to performance based measures.

While there have been very few organization learning theorists who have written about the general theoretical foundations of organization learning, there have been many theorists who have focused either explicitly or implicitly, on specific facets or theories that fall under the umbrella of organization learning. Unfortunately, in most cases there are very weak links to a fundamental concept of organization learning as discussed in this chapter. In Chapter II, this dissertation builds on the concept of organization learning presented here to develop a sociocognitive model of strategic management. In doing so, a discussion of some of the more specific theories that fall under the umbrella of organization learning will be presented.

This dissertation's concept of organization learning is built on five precepts, the final three of which are carried forward from the discussion of individual learning. The following discussion presents the precepts which have largely been elaborated on in the section on individual learning. The focus in this section of the discussion is on relating the precepts to the current theories of organization learning, and on highlighting the similarities and differences of the current theories. The intent of the five precepts is to build on the similarities of the various theories in order to develop a cohesive concept of organization learning.

1) **Organizations learn through individuals**; hence, individual learning is a fundamental building block of organization learning;

2) **Organization learning may be more or less than the sum of individual learning**; hence, understanding individual learning is not enough.

The first two precepts have received support from many organization learning theorists (Argyris and Schon, 1978; Daft and Weick, 1984; Fiol and Lyles, 1985; Bedeian, 1986; DeGeus, 1988; Klein, 1989; Huber, 1991). As Weick (1979) points out, organizations consist of patterns of interactions among individuals, but endure even when individuals leave. Not only do organizations survive after individuals have left, but organizations may retain traces of their influence in the systems, structure, traditions, products and services of the organization. These traces of individual learning are ways in which an organization learns, that are distinct from the ongoing learning of its individual members. That an organization is an entity, in many ways distinct from its members, may be more evident from the perspective of an outsider. For example, while customers may develop a rapport with the individuals in an organization, their allegiance to the products and services of an organization may also be attributed to factors such as the knowledge that a company has been in business for 50 years, that it is at the forefront in its industry, or that it provides replacement parts for its products within 24 hours. While there is no doubt that organization members play a major role in providing replacement parts within 24 hours, for example, the systems and structures of the organization as storehouses of learning play an equally important role. Most individuals need only recollect their last encounter with a shut-down of a computer system to appreciate the role of systems as storehouses of knowledge and as key inputs to a learning process. The foregoing discussion suggests that individuals play a central role in organization learning, but that individuals, independent of the organization context, do not account for organization learning. Although there has been widespread support for precepts 1 and 2, Bedeian (1986) concludes that the actual nature of the relationship between individual and organizational learning has often been neglected, and therefore warrants further study.

This dissertation highlights two aspects of organization learning not captured by individual learning: 1) the **process of integrating individual belief systems** to enable the organization to take concerted action; and 2) the **influence of non-human store houses of beliefs such as systems and structures** that endure after individuals have left.

Just as individuals integrate new information into their own belief systems, individuals within the organization must have some integration of beliefs in order for the collection of individuals that make up the organization to take concerted action. Recognizing the difficulty and complexity arising from the individual integration process highlights the complexity of the organization experience. For an individual, changes in beliefs arising from resolving a conflict or filling a gap are made within the context of the meaning that they alone attribute to the situation. The added complexity for organizations arises from the integration of a variety of beliefs by individuals who attribute various meanings to experiences which they are trying to share.

As with individuals, it is expected that shared beliefs requiring accommodation will be far more difficult to develop than shared beliefs requiring only assimilation. Argyris and Schon (1978) refer to the process of assimilation in organizations as single-loop learning and the process of accommodation as double-loop learning. They suggest a third type of learning called deutero learning which involves learning how to learn.

Just as it is difficult for individuals to undergo the process of accommodation, the research of Argyris and Schon supports the view that it is difficult for organizations to double-loop learn. Other researchers have developed concepts that parallel the types of learning suggested by Argyris and Schon. Bartunek and Moch (1987) suggest the concepts of first-order, second-order, and third-order change. Although Bartunek and Moch reference Argyris and Schon, they do not indicate why the introduction of a new categorization to explain the same phenomenon is necessary. Bartunek and Moch apply the concept of different types of organization change to a case study regarding a quality of work life intervention in a medium sized food processing plant. They conclude that managers, researchers and consultants must identify the type of change required in an organization since different types of change require different processes.

This dissertation suggests three primary mechanisms for integrating beliefs: 1) self-integration; 2) personal facilitation; and 3) artifactual facilitation. With self-integration, the individuals involved share enough beliefs, or have the motivation to find enough common ground, that they may be able to resolve the gaps or conflicts among their beliefs. With personal facilitation, one individual may form the linchpin in the organization. As in catalysis, certain elements, unable to react with others without very high temperatures or pressures, require a catalyst to aid the reaction. Likewise, individuals in an organization may need an empathetic individual to help them see others' points of view. With artifactual facilitation, systems, structures, and artifacts such as mission statements may serve as integrating mechanisms.

Simons' (1990) research provides an example of systems as an integrating mechanism. Simons found that organizations have diagnostic and interactive systems. Interactive systems are essentially learning mechanisms embedded within the organization's hierarchy. Subordinates state their expectations. The variance between expected outcome and actual outcome is then discussed, and the superior and the subordinate attempt to understand why the variance occurred. Within the interactive systems the emphasis is on developing shared understandings about the variance, not on minimizing it. Simons proposed that organizations have only one interactive system but that the type of interactive system varies from organization to organization. Fiol and Lyles (1985) suggest corporate culture, strategy that allows flexibility, structure that facilitates innovation, and the environment as integrating factors. Others have suggested social norms (Bettenhausen and Murnighan, 1985); and differences, contact, balanced power, trust and valuing (Friedlander, 1984).

3) Organization learning is a phenomenon involving **change in the organization belief system** and change in **behaviors (actions)**. The actual result of a change in beliefs and behaviors is referred to herein as the **product** of the learning process.

> 3a) Changes in the **organization belief system** relate to changes in the **individual beliefs** and **other store houses of beliefs** such as structure and systems.

As with individual learning, the third precept is an area of considerable dispute in organization learning. For example, Fiol and Lyles (1985) distinguish cognitive change and behavioral change by suggesting that cognitive change is learning and behavioral change is adaptation. Similar to the relationship between cognition and behavior depicted in Figure 1.1, Fiol and Lyles discuss the relationship between levels of cognitive change which they refer to as learning, and behavioral change which they refer to as simply change, or adaptation. They characterize firms in mature industries with stable environments as having low levels of cognitive or behavioral change, as indicated by the "no learning" quadrant in Figure 1.1. They suggest that organizations in crisis, or organizations undergoing rapid restructuring, through mergers, for example, are characterized by a high level of behavioral change with a low level of cognitive change. They suggest that this is a transitional stage as was suggested in the case of "forced learning" and "experimental learning" presented in Figure 1.1. Friedlander (1984) also supports the concept of "forced learning" when he suggests that mandated policy changes, for example, lead to changes in organization behavior, but not to changes in organization cognition. Fiol and Lyles characterize organizations with a low level of behavioral change, but a high level of cognitive change as being in a turbulent environment where "too much change would cause the organization to lose its sense of direction" (p. 807). Or, as has been suggested in this dissertation, it may be simply a matter of the timing of the behavioral change as opposed to an overt resistance to change. In the discussion surrounding Figure 1.1, "blocked learning", "surface learning", and "reinforced learning" were advanced as different kinds of transitional learning where cognitive change is not matched by behavioral change. And finally, Fiol and Lyles suggest that a high level of cognitive and behavioral change is appropriate for organizations in a moderately turbulent environment. This dissertation suggests that this type of "integrated learning", as illustrated in Figure 1.1, will be a source of competitive advantage for organizations (DeGeus, 1988) and therefore should not be limited to organizations in moderately turbulent environments, as suggested by Fiol and Lyles.

In support of Fiol and Lyles, Daft and Weick (1984) also distinguish between cognitive change and behavioral change. However, they take the opposite position. They state that "learning is distinguished from interpretation by the concept of action (p. 286)", suggesting that learning involves behavioral change while interpretation involves cognitive change. Senge (1990) also provides support for the view that learning is associated with behavioral change. He states that "real learning is always 'in the body', it's ultimately connected to action" (p. 1).

Huber (1991) and Gioia and Manz (1985) argue that learning encompasses both cognitive change and behavioral change. Gioia and Manz state that "although a great deal of energy has been spent debating the issue of cognition versus behavior, less effort has been devoted to the study of the more important issue of the connection between cognition and behavior" (p. 527).

Whether organization learning encompasses cognitive change, behavioral change, or both is not a trivial matter. The definition which theorists adopt becomes the belief system that, in essence, guides their discoveries about the phenomenon of organization learning. This dissertation argues that defining organization learning as simply cognitive or behavioral, unnecessarily narrows the perspective of organization learning. Furthermore, in an effort to distinguish between the two types of change, theorists may fail to recognize and investigate the important linkages between the two.

4) The process of organization learning can be conceived of as a dynamic interplay among the organization belief system, the behaviors of its members, and stimuli from the environment where beliefs are both an input and product of the process as they undergo change.

Although there are some exceptions (Argyris and Schon, 1978; Fiol and Lyles 1985), with regard to the fourth precept, most theorists have an implicit view of organization learning as a process. Argyris and Schon, and Fiol and Lyles, explicitly recognize the content or the product of the learning process. Whereas, for example, Friedlander (1984) states that "learning is the process that underlies and gives birth to change...learning is the process; change is the outcome (p. 194).

This dissertation suggests that the focus on process has arisen largely because the products of the learning process, namely changes in cognition and behavior, have been viewed solely as outputs. Their role as inputs which guide and modify the process has been underutilized. This linear view of process leading to outcomes may also explain the desire of theorists to separate cognition and behavior, since they are often viewed as following a path where changes in cognition lead to changes in behavior. However, as has been described, the relationship between the two can be complex. Weick (1979) highlights the complexity between cognition and behavior with his statement: How can I know what I think until I see what I say.

5) The effectiveness of learning should be assessed on the basis of its utility in guiding behavior relative to the organization's relevant domain.

The fifth precept is supported by Huber (1991) who states that "entities can incorrectly learn, and they can correctly learn that which is incorrect" (p. 89), and by Friedlander (1984) who states that "the chaos of learning is frequently incompatible with being productive, at both the individual and organizational levels" (p. 195). However, this view has been disputed by Fiol and Lyles (1985) and by Argyris and Schon (1978), who equate learning with performance enhancement. Gronhaug (1977) goes as far as to suggest that "to get 'correct' organizational learning and adaption, perceptions and cognitions have to be both complete and unbiased" (p. 27).

In the section on individual learning it was argued that performance provides important feedback about learning. However, to equate learning with improved performance may be misleading, since the performance enhancement may be more attributable to a favorable environment than to organization learning. More importantly, the learning and the benefits of the learning may be separated in time, or the benefits may be masked by intervening forces.

SUMMARY

In summary, the concept of organization learning presented in this dissertation is based on five precepts. The first was that organizations learn through individuals; hence, it is important for management theorists to be familiar with the theories, concepts and research on individual learning. That there are aspects of organization learning not captured by individual learning was the second precept. It was suggested that there are two critical aspects of organization learning not captured by individual learning: 1) the process of integrating individual belief systems which enable the organization to take concerted action; and 2) the influence of non-human store houses of beliefs such as systems and structures that endure after individuals have left the organization. Argyris and Schon's concepts of single-loop learning and double-loop learning in organizations, demonstrate how parallels can be drawn between concepts of individual and organization learning, since the concepts are very similar to the individual learning processes of assimilation and accommodation proposed by Piaget. The third precept stated that organization learning involves both cognitive change and behavioral change. The contention between the behavioral and cognitive perspectives on individual learning has been manifested in theories of organization learning as well. Therefore, rather than trying to integrate the two schools of thought, organization learning theorists have moved in the direction of developing a narrow view of organization learning as being associated with either changes in cognition or changes in behavior. This dissertation has suggested that such narrow definitions unnecessarily limit the perspectives of organization learning researchers. This limitation poses a great risk that researchers will fail to recognize the important interactions between the two. The fourth precept stated that the process of learning is dynamic, involving interactions among beliefs, behaviors and stimuli from the environment. However, changes in beliefs are inputs into the learning process, since they guide what is attended to; but these changes are also a product of the process as the beliefs undergo modification. The fifth precept stated that the effectiveness of learning should be assessed based on its utility in guiding behavior relative to the organization's relevant domain. Therefore, while performance provides valuable feedback about learning, it may be misleading, primarily because the learning and its benefits may be separated in time.

CHAPTER II - THE MODEL:

A SOCIOCOGNITIVE MODEL STRATEGIC MANAGEMENT

Seeing, hearing, sensing, feeling,
Shaped and coloured by one's own being.

The senses as tools of the mind,
Portray an image of a different kind,

To each person who experiences life,
For some it's joyful, for others strife.

A fresh Spring rain can be cursed or blessed.
The first snow of Winter, is it foe or guest?

Each person with a unique view,
A different perspective with something new,

Differences to be cherished, not subdued,
To capture the world in its multiple hues.

Crossan, 1981

The foregoing poem focuses the reader's attention on a central building block of this dissertation: that **individuals interpret things differently as a result of the unique perspective they bring to a situation and these differences may prove to be of value.**

The concept of organization learning presented in Chapter 1 discussed the role of cognition (beliefs) in the learning process. It explained that individual beliefs both guide and are a product of the learning process. Beliefs guide the process since they determine what is attended to and how it is interpreted. Since learning arises from the recognition and resolution of gaps and discrepancies between one's belief system and the stimuli one encounters, individuals with different belief systems will identify different gaps and discrepancies.

The identification of different gaps and discrepancies leads to different interpretations. In terms of organization learning, it is suggested that different interpretations may in fact be fruitful if the individuals can integrate their differences. Much like a puzzle, individuals with different belief systems hold different pieces of a puzzle. If the individuals can share their different perspectives, they will be able to see a larger portion of the puzzle than each one holds. However, the puzzle that individuals in organizations face is different from the traditional notion of a puzzle: no one knows the whole picture, and the picture is dynamic and constantly changing, rather than static.

This chapter builds on the concept of organization learning presented in Chapter I to develop a sociocognitive model of strategic management. The model's sociocognitive focus highlights the importance of individual interpretation, as well as the collective aspects of interpretation arising from the interaction among individuals. Furthermore, the model embodies the precepts of organization learning developed in Chapter I since it explicitly recognizes: 1) that there are individual and organizational aspects of organization learning; 2) that learning encompasses both the products of change and the process of change; and 3) that learning includes both cognitive and behavioral change. This chapter begins with a discussion of how an interpretive perspective relates to other perspectives in strategic management. An overview of the model is then presented, including a discussion of the precepts of organization learning that the model embodies. Finally, a more detailed discussion of the elements of the model is presented.

PERSPECTIVES OF STRATEGIC MANAGEMENT

The importance of interpretation has not been widely recognized in the field of strategic management. In the management literature, several different perspectives on strategic management have been either explicitly or implicitly adopted. The following discussion categorizes them into three perspectives: 1) Rational Perspective; 2) Information Perspective; and 3) Interpretive Perspective.

Rational Perspective

Research adopting a rational perspective seeks to categorize and identify the relationships among various components of what is viewed as an objective reality. The rational perspective is exemplified by much of the strategy-structure-environment literature. The focus is placed on strategic content, rather than on process, in an attempt to identify the best fit between different types of strategies and organization structures in different types of environments. For example, Dubofsky and Varadarajan (1987), in their review of the research on the relationship between a firm's degree of diversification and its subsequent performance, state that "the findings reported in [previous] studies indicated that the type of market in which a firm operates affects performance and that related diversification aids, but does not insure favourable performance" (p. 597). This rational perspective does not account for differences in individual perception. As Stubbart (1989) points out, the assumption is that "managerial thinking can be totally, and safely, ignored for research purposes because managers all think the same" (p. 326). With no links to individual perception, the implicit assumption is that there is a one to one correspondence between what exists and what an individual knows. Essentially, the individual is portrayed as "all-knowing". The implicit and sometimes explicit (i.e. economics) assumption is that one's mental map of the world is a copy of an objective reality. As March and Simon (1958) state, a rational perspective, or what they refer to as "traditional theory", has "rather severe assumptions about the environment of an individual in an organization, the impact of that environment on him, and his response to it" (p. 34). Essentially, the environment is viewed as a well-defined stimulus, generating predictable responses from individuals. Therefore, the task for researchers is to categorize and identify relationships so that managers, having an unbiased view of the world, can make better decisions.

Although research adopting the rational perspective has provided valuable insight into management issues, its shortcomings have been well documented by Allison (1971) and Johnson (1987). Johnson suggests that one of the dangers of a rational perspective is that it is "a de-humanized approach to management where efficiency, productivity and data become overbearing concerns" (p. 18).

Information Perspective

Dissatisfied with the view of individuals as "all-knowing", a second camp of researchers has characterized one's mental map of the world as a subset of reality. Building on Simon's earlier concept of "bounded rationality", Preitula and Simon (1989) state that "there are three limits on the power of reasoning common to all of us mortals" (p. 121). They point to limits on attention, working memory and long-term memory, as factors that limit rationality. Researchers adopting an information perspective argue that what an individual sees is what is important. For example, Anderson and Paine (1975) write that: "It may be inappropriate, for the researcher simply to examine the relationship between certain absolute properties of the environment and the internal characteristics of the firm without examining in detail the strategic choices made by the boundary persons" (p. 811). The implicit assumption is that one's mental map of the world is a copy of the world one encounters. The information perspective makes no distinction between data and information. It implies that different individuals will have an unbiased interpretation of the same data. Hence data is information. Therefore, the key issues for managers relate to obtaining the right information.

The information perspective discussed here is similar to Daft and Huber's (1987) "systems-structural perspective". They summarize their view of the systems-structural perspective as follows:

> ...the perspective focuses on reducing ignorance by providing data. Information is treated as if it were a tangible good that is transported in containers called messages. Data are acquired by boundary units or personnel who use the data and/or distribute it to appropriate departments. The primary use of information, in this paradigm, is as input to decision-making or controller-coordinator units. It is implicitly assumed that these units know how to use the information, that they merely need to obtain "the facts" in order to take action. (p. 8)

Although Daft and Huber's summary suggests that the systems-structural perspective and the information perspective are virtually identical, they in fact have a somewhat more expanded view that recognizes the cognitive limitations of individuals in processing information.

Interpretive Perspective

A third camp of researchers has extended the view of the second camp to suggest that one's mental map of the world is **an abstraction of the world one encounters.** The difference arises from the unique perspective that individuals bring to bear on a situation. One's mental map of the world is a template that acts as a filter through which one interprets stimuli. As De Bono (1976) states: "data become information when they are looked at through the spectacles of an idea" (p. 33).

The distinction between the interpretive and the rational perspective is quite stark: in the rational perspective individual perception is not considered, while in the interpretive perspective individual perception is central. The rational perspective views reality as something that is objective, while the interpretive perspective views reality as something that is constructed.

What may appear to be subtle differences between the information and interpretive perspectives are also quite critical. Several examples juxtaposing the two perspectives will be used to highlight the differences.

The information perspective argues that what is important is getting the right information, while the interpretive perspective argues that it is the interpretation of that information that is critical. For example, a company entering a new market may commission a consultant to prepare a report on the attractiveness of the market and to recommend an entry strategy. The information perspective would focus on whether the report contained the "right" information as the key variable while the interpretive perspective would focus on the willingness and ability of the management group to interpret the information in the consultant's report as the key variable. As Hildebrand (1989) suggests, managers often have the "right" information, but they fail to interpret it effectively.

The reading of this dissertation provides another example. The information perspective would suggest that those who have read it will have a common understanding of what it says. The interpretive perspective suggests that the reader of this dissertation will understand what the writer is trying to convey only if the reader shares the writer's perspective, or template. However, what is more likely to happen is that the reader will understand some of what the writer is trying to convey but, as a result of the reader's unique perspective, will also come to know things that were not intentionally conveyed. Therefore, each individual will have a unique interpretation of this dissertation.

This dissertation suggests that, while research adopting a rational or information perspective has provided useful insight into strategic management issues, research adopting an interpretive perspective fills a tremendous void in strategic management research. The void relates to understanding the powerful influence of managerial cognition on the decisions and actions of organizations. While many readers may also be advocates of the interpretive perspective, it is suggested that, in practice, advocates of the interpretive perspective frequently find themselves acting on the assumptions of the information perspective. To greater or lesser degrees, people often underestimate the multiple interpretations that exist, given the vast multitude of perspectives through which individuals view the world. We operate under the assumption that if we have seen, heard, or read something, we understand it, and we all have similar understandings. As Weick (1979) suggests, the statement "I'll believe it when I see it" (information perspective) should be reversed to say "I'll see it when I believe it" (interpretive perspective). Certainly there are times when we know that we are out of our league, but surprisingly these are not the problem areas. It is in the arenas in which we are the most comfortable that we quickly assume we have understood things and subsequently take actions based on faulty assumptions. As Ellis (1972) points out, in the most difficult learning situations we are required to make new responses to what are perceived to be the same stimuli.

For the sociocognitive model developed in this chapter, the implications of the interpretive perspective are critical, since this view recognizes the heterogeneity of individual perspectives and emphasizes the importance of those differences for strategic decision making. The power of examining perspective is evidenced by the observation made by Dunn and Ginsberg (1986) that two people sharing the same perspective will view different situations more similarly than individuals with different perspectives viewing the same situation. In essence, we see what we are prepared to see. Nystrom and Starbuck (1984) state that:

> some people see crises arising and others do not; some understand technological and social changes and others do not. What people see, predict, and understand depends on their cognitive structures. (p. 55)

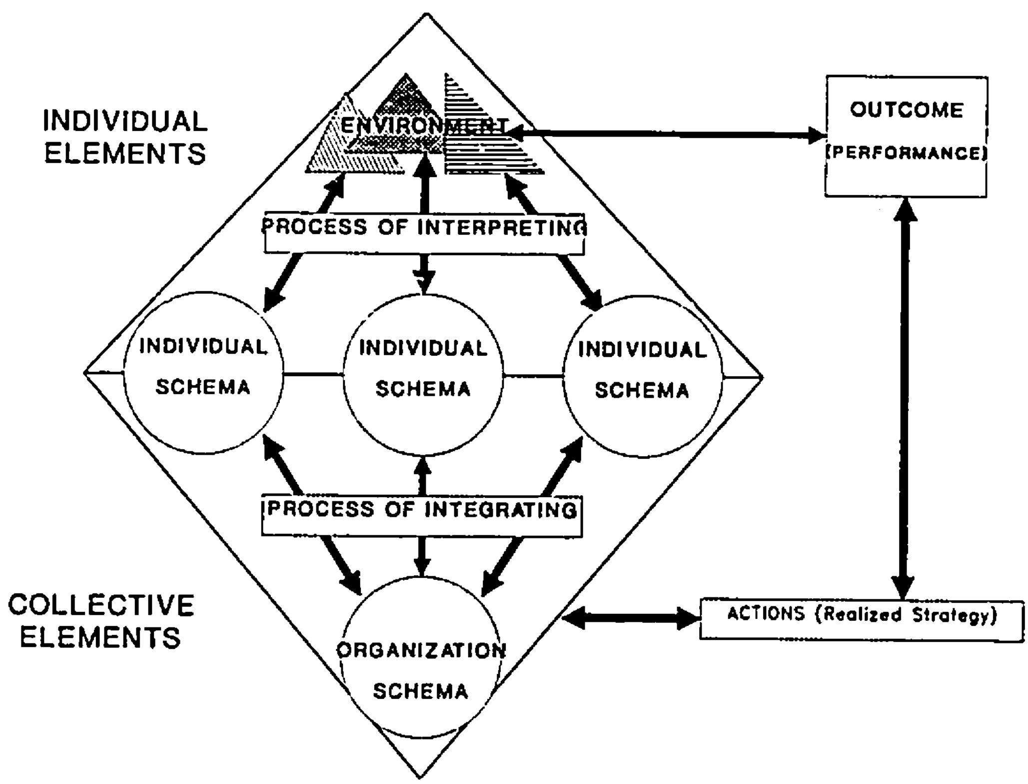
Much of the strategic management literature has adopted a rational perspective, generating insight into the relationship among various structures and strategies for organizations in different environments. However, as stated in the Introduction, this perspective fails to take into account the critical issue of how organizations learn about their environment. In Chapter I, it was demonstrated that the individual plays a key role in organization learning. Given the importance of interpretation, it is submitted that a more comprehensive model of strategic management is required: one recognizing the importance of interpretation and the interplay between individuals and the organization in explaining how organizations learn about their environment. The following discussion presents an overview of such a model, followed by a more in-depth discussion of its components.

OVERVIEW OF THE MODEL

The sociocognitive model of strategic management, shown in Figure 2.1 draws on the theory of organization learning presented in Chapter I and builds on Neisser's (1976) perceptual cycle of the relationship between cognition and reality. Neisser suggests that the "actual physical world" we encounter, referred to in Figure 2.1 as the **environment**, derives its meaning from the belief system through which the individual perceives it. Neisser refers to the belief system as the schema. In Figure 2.1, the belief system is referred to as the **individual schema**. Neisser refers to the process of interaction between the individual schema and the environment as the "perceptual exploration process". In Figure 2.1, it is referred to as the process of **interpreting**.

While Neisser deals with cognition and reality at an individual level, this conceptual model is extended to a group setting. The process of **integrating** is similar to the process of interpreting, but rather than individuals interpreting stimuli from their environment, a group is attempting to create a shared meaning from their collective experiences. The result of the process of individual interpretation and group integration is an **organization schema**. The organization schema is the collective belief system which guides **action.** In this model, cognition and behaviors or actions are inter-related: cognition guides behaviors, but behaviors, providing the stimulus for interpretation, may lead to changes in cognition. The collective actions of organization members ultimately result in **performance outcomes.** In turn, performance outcomes affect the environment and become stimuli that are fuel for further interpretation. As will be suggested in Chapter III, different levels of interpretation and integration may help explain why some organizational schemas seem to reflect the environment better, as determined by the performance of the organization.

FIGURE 2.1-A SOCIOCOGNITIVE MODEL OF STRATEGIC MANAGEMENT



Although the foregoing overview began by discussing the environment and finished with a discussion of performance outcomes, it is not intended to suggest that the process is in any way linear. There is no doubt that the process is iterative and that at any one point in time, any or all of the components of the model may be operating concurrently.

This model may be seen as an expansion of the concept of organization learning presented in Chapter I. Figure 2.1 recognizes both <u>individual aspects</u> of learning (**interpreting** and **individual schemas**) and <u>collective aspects</u> (**integrating** and **organization schemas**). It suggests that individuals have capacities for learning that are distinct, yet intertwined with the collective capacity for learning. The model encompasses both the <u>processes</u> of learning (**interpreting** and **integrating**) and the <u>products</u> or substance of the learning process (**individual schemas, organization schemas** and **actions**). When viewed as a <u>product</u>, learning is broadly defined to encompass changes in belief structures and systems which include: cognition (**schemas**), behavior (**actions**) and systems. Although systems are recognized as a product of learning, they are not expressly represented in the model. As will be discussed in Chapter VI, a key role for future research will be to determine how to incorporate systems and other non-human store houses of knowledge into an even more comprehensive model. The following discussion presents the elements of the sociocognitive model in greater detail.

COMPONENTS OF THE SOCIOCOGNITIVE MODEL

Environment

The model purposefully makes no attempt to distinguish between the internal and external environment of the organization. From a cognitive perspective, both the internal and external environment are viewed as sources of stimuli that are perceived by an individual, and which affect that individual's schema. As such, there are more similarities than differences between the two. Essentially, everything outside the individual is part of his or her environment. The boundaries of the organization are therefore blurred. For example, performance outcomes and the other individuals in the organization are part of the environment of any one individual. Other examples of stimuli from the environment include: hearing of a price reduction by a competitor, receiving a customer complaint, or reading about the destruction of the Berlin wall. Neisser (1976) describes the environment as follows:

> In the normal environment most perceptible objects and events are *meaningful*. They afford various possibilities for action, carry implications about what has happened or what will happen, belong coherently to a larger context, possess an identity that transcends their simple physical properties. These meanings can be, and are perceived...This aspect of perception has long been a stumbling block for psychology. It has seemed that stimuli themselves cannot possibly have meaning, because they are merely patterns of light or sound or pressure. The meaning must be supplied by the perceiver *after* he has registered the stimuli. (p. 71)

Individual Schema

The meaning supplied by the perceiver arises from the individual's belief system or schema. The schema can be viewed as a web of beliefs about concepts and their inter-relationships. As was demonstrated in Chapter I, the individual's schema both guides and is a product of the interpretive process as it undergoes modification. Theorists have used a variety of terms to describe cognitive schemas. Walsh's (1989) comprehensive list of theorists and their labels for describing what Walsh refers to as "knowledge structures", is reproduced in Table 2.1. While there is great divergence on the labels, there is significant convergence on the meaning. Neisser (1976) defines schemas as active cognitive structures which frame problems and orient information search. They act as the frame of reference that directs attention and guides action. Schemas are the template through which we interpret the environment.

Some examples may help to demonstrate this concept. Medical students looking through a microscope for the first time do not see the same things the trained physician sees, although they are looking at the same thing. The chess master and the novice see different things in viewing the same game of chess. In essence, a cognitive schema is like a road map. If you don't have a map of the territory, it is difficult to find your way. As well, the more detailed and complex the map, the more one understands the nuances of the territory. However, the map also limits or restricts what one perceives.

In essence, the schema is the individual's map of the environment. Individuals will have different schemas about aspects of the environment which may guide different actions, possibly leading to different outcomes, as Neisser describes using the example of a chess master:

> The information that the master picks up from the chessboard determines not only where he will move his pieces but where he will move his eyes. Observations show that a good chess player's eye movements are closely related to the structure of the position on the board; he looks at crucial pieces and crucial squares. He quite literally sees the position differently - more adequately and comprehensively - than a novice or a nonplayer would. Of course, even the nonplayer sees a great deal: the chessmen are of carved ivory, the knight resembles a horse, the pieces are (perhaps) arrayed with a certain geometrical regularity. A young child would see still less: that the pieces would fit in his mouth, perhaps, or could be knocked over. A newborn infant might just see that "something" was in front of him. To be sure, he is not mistaken in this; something is in front of him. The differences among these perceivers are not matters of truth and error but of noticing more rather than less. The information that specifies the proper move is available in the light sampled by the baby as by the master, but only the master is equipped to pick it up. (p.181)

DeNisi, Cafferty and Meglino (1984) provide an excellent summary of the schema literature from the field of psychology as it applies to the process of conducting performance appraisals. They cite several studies that suggest that "the purpose for which one is seeking information will influence what types of information are sought and how that information is later stored" (p. 369), and that "information consistent with a schema, or confirming an expectation is more likely to be recalled" (p. 378). They point to a study by Cohen (1981) which demonstrates that "people may remember schema-consistent information which they never saw" (p. 378).

Although there has been considerable research in the field of psychology on individual schemas, there has been scant research in the field of management (Walsh, 1985). An example of one of the few empirical studies conducted by a researcher in the field of management, on individual schemas, is Walsh's (1985) dissertation. Walsh examines three categories of antecedents of schema structure: 1) individual differences which include cognitive complexity, tolerance for ambiguity, field dependence, decision making focus and locus of control; 2) work experience as measured by the amount and functional area of proficiency; and 3) organizational context. Walsh's study involved 121 executives who performed a recall task, a sorting task, a survey and a case analysis. The study was designed to examine the relationship between the antecedents of schema structure, and the relationships among schema structure, the information utilized in the decision process, and the outcomes of the decision. Given some of the limitations of Walsh's study, he was not able to comment on several of the proposed relationships. However, he found that schema structure varied with work experience but not with the functional background of the manager as had been proposed previously by Dearborn and Simon (1958).

Process of Interpreting

The model suggests that individuals play the central cognitive role in an organization's interpretation of the environment. While it is recognized that there may be organizational aspects to environmental interpretation, such as systems and structures, those aspects are beyond the scope of this dissertation. However, it should be recognized that systems and structures can be viewed as the traces of individual interpretations, and furthermore, as part of the environment that individuals interpret. It is hopeful that future research will shed more light on this issue. It is suggested that the process of interpreting can be broken down into both cognitive and behavioral elements.

The behavioral element of interpreting, which is often but not always guided by the cognitive element (eg. experimental learning), can be viewed as the physical processes that individuals go through in learning about the environment. It encompasses a broad range of activities including: whether individuals seek out information; what kinds of information they look for; where they look for it; and how they go about their search. The following discussion provides examples of some of the research on the behavioral process of interpreting.

Aguilar's (1967) research on scanning the business environment is representative of this area of research. Aguilar studied the kinds of external information managers obtain. the sources they use to obtain information, and the ways in which they collect it. Aguilar found that environmental scanning was fragmented when viewed from a rational perspective: individuals failed to gather reasonably accessible information that was important to other units in the company, and decision makers failed to receive important information already residing in the company. Hambrick (1982) examines environmental scanning and organization strategy in 17 organizations in three industries. In particular, Hambrick examines the frequency with which respondents learned of events, their interest in staying abreast of various subsectors of the environment and the percentage of their scanning time spent on different sectors. He found that "organizations did not indicate a consistent, concentrated tendency to scan according to their organizations' strategies" (p. 169). Daft, Sormunen and Parks (1988) in a study of 50 manufacturing firms found that high-performing firms scanned more frequently and more broadly. However, Snyder's (1981) study of 871 U.S. firms in six industries shows that, while firms in volatile environments were more involved in environmental scanning, no positive relationship existed between the extent to which firms scan their environment and their financial performance. Miller and Friesen (1983) found a tentative link between increases in environmental dynamism, hostility and heterogeneity, and changes in the amount of analysis by the top management team (TMT) in a sample of 50 Canadian firms.

At a micro level, considerable work has also been done to examine the behaviors of individuals as they undergo the process of interpreting stimuli in a contained environment. For example, Bouwman (1984) uses protocol analysis to examine expert versus novice decision making in accounting. He found that novices used a passive, inductive strategy of collecting data and observing results versus a more directed search employed by the experts. Experts were more likely than novices to analyze more years of data and to focus on contradictory information.

In summary, results from research on the behavioral process of interpreting suggest that the activities individuals in the organization take to interpret their environment may have important performance related ramifications. It appears, however, that in most organizations the behavioral process of interpreting is informal and ad hoc. Research at the micro level suggests that the directed search activities of experts may be guided by more complex schemas, whereas, novices, who have simple schemas, are more likely to take actions and then try to interpret the results. The distinction between the activities of novices and experts provides an excellent example of how cognitive schemas can guide, or fail to guide, interpretive behaviors as discussed below.

Examples of research on the cognitive process of interpreting include the work of Keisler and Sproull (1982), Barnes (1984), Duhaime and Schwenk (1985), and Schwenk (1984), relating to cognitive biases that influence one's interpretation of the environment. For example, Keisler and Sproull (1982), in their review of the literature, describe five concepts that dominate theories about cognitive biases:

1) the augmentation principle - decision makers overestimate the influence of plausible causal agents;

2) the discounting principle - decision makers discount the influence of causal factors beyond the major factor if one exists;

3) illusory correlation - assuming events are correlated due to their "fortuitous association";

4) illusory causation - misinterpreting correlation as causality; and

5) automatic scanning - individuals gather and categorize information automatically without any conscious effort or attention.

Barnes (1984) identifies five types of judgemental bias that create cognitive bias:

1) availability - events more easily recalled are deemed more likely to occur in the future;

2) hindsight - knowledge that an event has occurred increases predictions that it would have occurred;

3) misunderstanding the sampling process - putting too much emphasis on small samples and [illegible]y trends;

4) judgements of correlation and causality - correlation misinterpreted as causality; and

5) representativeness - outcomes are representative of the evidence, regardless of the reliability of the evidence.

Barnes also suggests that individuals are generally more confident about their predictions than they should be. He attributes this to the desire to eliminate uncertainty by ignoring disconfirming information. Duhaime and Schwenk (1985) identify reasoning by analogy, illusion of control, escalating commitment, and single outcome calculation, as four cognitive biases which may affect corporate acquisition and divestment decisions.

The cognitive element also includes research on cognitive style which suggests that individuals have preferences for different methods of gathering, evaluating and analyzing data. Haley and Stumpf (1989) link cognitive style to types of cognitive biases. They conducted a simulation involving managers from four corporations who participated in four runs of the simulation. They found that 38 of the 41 members in the study exhibited one or two types of biases which were associated with cognitive style.

Research on the cognitive processes of interpreting suggests that there are many types of cognitive biases affecting an individual's interpretation of the environment. Therefore, an expert who has a more complex schema about a particular environmental domain, may exhibit biases in cognitive processing that lead to misguided conclusions.

In summary, the foregoing section has discussed the process of interpreting, suggesting that it can be sub-divided into behavioral and cognitive processes. Examples of research on both types of processes were given to provide the reader with a better understanding of the process of interpreting, and to demonstrate how current research can be applied to the model.

Process of Integrating

In Chapter I it was suggested that one of the distinguishing characteristics between individual and organization learning is the process of integrating individual schemas. While it is extremely difficult to separate the group process of integrating from the individual process of interpreting, the distinction provides useful insight. For example, Bettenhausen and Murnighan (1985) draw on Sherif's early experiments (1936) with light movement to point out that collectively produced frames of reference are more enduring than individually produced frames of reference.

Three types of integrating mechanisms were proposed in Chapter I: 1) self-integration where the individuals involved integrate their differences; 2) personal facilitation where a leader intervenes to resolve differences; and 3) artifactual facilitation where systems, structures and strategies help to resolve discrepancies.

An example of mechanisms for self-integration is provided by Friedlander (1984) who suggests that trust and respect are necessary to allow individuals to explore differences. He states that "without valuing, mutual respect and care between subsystems, differences tend to result in digging in by these components, each to defend its current position" (p. 206).

Bartunek (1984) comments on the role of leadership in the process of integrating. Bartunek studied the changes in interpretive schemes in a religious order and found that "major changes in interpretive schemes occur through dialectical processes in which old and new ways of understanding interact, resulting in a synthesis...the way the organization's leadership initiates or responds to interpretive schemes limits the type of change in understanding that can occur" (p. 355).

An example of artifactual facilitation is provided by Eden et al. (1981) who suggest that a team is constantly negotiating reality amongst its members. However, they point out that the negotiation is usually implicit. They advocate a cognitive mapping technique which makes the negotiation explicit, thereby facilitating the integrating process. While the work of Eden et al. provides an example of systems as an integrating mechanism, the research by Bartunek and Moch (1987) provides an example of organization myths, stories, and dominant metaphors as integrating mechanisms. They applied the case study data from a quality of work life intervention in a medium sized food processing plant to their concepts of first-order, second-order, and third-order change. Their insights from the case study suggest that shared schemas are sustained and modified through organization myths, stories and dominant metaphors. As well, Meyer (1982) in a case study of nineteen hospitals indicates that "organization ideologies are manifested and sustained by beliefs, stories, languages, and ceremonial acts. The data suggest that harmonious ideologies accompany simple structures, but that discordant ones accompany elaborate structures" (p. 45).

In a different line of inquiry about the process of integrating, several researchers have compared the quality of decisions made relative to three types of integrating processes: dialectical inquiry (DI), devil's advocacy (DA), and consensus (C), (Schweiger and Finger, 1984; Schweiger, Sandberg, and Ragan, 1986; Schweiger and Sandberg, 1989; Schwenk, 1989). DI and DA are structured processes that foster constructive conflict. In DI, two opposing arguments are pitted against each other, while in DA one argument is presented and then its drawbacks discussed. In a laboratory study, Schweiger et al. (1986) found that DI and DA led to better decisions than did the C mode of inquiry, but that the C groups reported a greater desire to work together in the future and a higher commitment to the decision. The results were supported by Schweiger and Sandberg (1989) who suggested that DI and DA make better use of the capabilities of group members.

Organization Schema

Through the process of trying to integrate individual schemas, the group will evolve an organization schema, or what others have referred to as a collective cognitive map (Axelrod, 1976), organization ideologies (Brunsson, 1982; Meyer, 1982), culture and systems of shared meaning (Smircich, 1983), organization frames of reference (Shrivastava and Schneider, 1984), shared interpretive schemes (Bartunek, 1984), a dominant logic (Prahalad and Bettis, 1986), an organization mind (Sandelands and Stablein, 1987), or an organization order (Nonaka, 1988).

Donnellon, Gray and Bougon (1986) suggest that:

> after decades of research, we still know little about how groups make 'collective' sense of their experience and how they come to take organized action (p. 43). Although several organizational theorists have proposed that shared meanings underlie the phenomenon of organizing, relatively little empirical work has been done either to demonstrate the extent to which this cognitive similarity is necessary or to identify the communication mechanisms by which it is generated (p. 51).

They suggest two different perspectives on *the relationship between the degree of shared understanding of organization members and taking organized action*. The first is that "organization members act in a coordinated fashion as a result of sharing a common set of meanings or interpretations of their joint experience" (p. 43). The second, advocated by Weick (1979) "argues that only minimal shared understanding is required, because organization is based primarily on exchange" (p. 43). Donnellon et al., selected for analysis one hour of video-tape of a behavioral simulation involving a group of undergraduate students whose discussion progressed from disagreement to unanimous action. They found that "equifinal meaning" rather than shared meaning enabled the groups to shift from a state of disagreement to organized action. "Equifinal meaning" is a concept which suggests that there may be multiple routes to the same end, and that groups need only have a shared expectation about their exchange relationship. "That is, organization members may have different reasons for undertaking the action and different interpretations of the action's potential outcomes, but nonetheless act in an organized manner" (p. 44).

The foregoing discussion suggests that the appearance of concerted actions may not be the best barometer of whether the organization schema is one that represents shared understanding. This situation occurs, not only because of the potential for equifinal meaning, but also because individuals do not convey their intentions or misinterpret intentions, as portrayed by the example of the "Abilene Paradox" as recounted by Harvey (1988):

> Organization members fail to accurately communicate their desires and/or beliefs to one another. In fact, they do just the opposite and thereby lead one another into misperceiving the collective reality. Each member of the Abilene group, for example, communicated inaccurate data to other members of the organization. The data, in effect, said, 'Yeah, it's a great idea. Let's go to Abilene,' when in reality members of the organization individually and collectively preferred to stay in Coleman. (p. 20)

This dissertation suggests that the organization schema may not necessarily represent any overlap of the individual schemas. It will include, to a greater or lesser degree, some areas of common understanding or shared meaning, areas of indifference and areas of contention. While having points of similarity in schemas is a necessary precondition for even equifinal meaning, having points of difference is essential to providing continued varied interpretations of the environment. Huber (1991) states that "more organization learning occurs when more and more varied interpretations are developed...and when more organizational units develop uniform comprehensions of the various interpretations" (p. 90). Huber's comments highlight an apparent paradox. How do organizations simultaneously have varied interpretations and uniform comprehension?

Although the concept of equifinal meaning helps to explain how varied interpretations can result in concerted action, it does not support the view that uniform comprehension is required. However, Weick (1979) argues that it is the concerted action that may ultimately generate uniform comprehension.

Brunsson (1982), in his case study of organization change and stability in seven organizations, found that precision and complexity in the organization ideology (schema) facilitated change. More stable ideologies were characterized as simple, vague and widely applicable. Brunsson suggests that changes in schema must occur before action begins since "ideological inconsistencies increase uncertainty and make it extremely difficult to marshall commitments for organizational actions" (p. 41). Brunsson's findings do not support the concept of equifinality, since they suggest that uncertainties and inconsistencies in the organization schema make it more difficult, rather than easier to take action.

As well, the work of Brief and Downey (1983) does not support the concept of equifinality. They studied the role of "implicit theories about organizing", which are essentially organization schemas about the structure of organizations. They hypothesize that the sharing of implicit theories of organizing is an important determinant of the strength of social bonds in an organization. They further suggest that the stronger the social bond, the higher the commitment, and that the "correctness" of the implicit theory does not affect its function as the glue in the organization's social fabric (p. 1078). Although Brief and Downey draw on examples in the auto industry to illustrate their concepts, they provide no test of their theory.

In summary, research on the nature of organization schemas is sketchy and controversial since it has been based on anecdotal or case analysis which may be more influenced by the researcher's schema about the nature of organization schema, than by the phenomenon itself. The primary source of controversy relates to whether a shared organization schema is desirable, and necessary, for organizations to take concerted actions as discussed below.

Action-Schema Interface

An important aspect of the model is the action-schema interface. Conventional views of strategic decision making assume that cognitive change precedes behavioral change - knowledge precedes action. The model implies that individuals take action based on their individual and organization schemas, but that schemas are also modified as a result of reflecting on actions taken. As well, individuals differ in their bias for action. In some cases, individuals may suspend their own schema and take action because they trust or value the judgement made by someone else. In this instance, behavioral change may precede cognitive change since individuals may suspend their own schema, reflect on the action taken, and subsequently modify their schema. In Chapter I, this state was referred to as "experimental learning". However it is suggested that in cases of "forced learning", where individuals are told to take a particular action when they have not suspended their schema, cognitive change is unlikely to follow, since subsequent actions will be reflected upon and interpreted through the lenses of their current schema.

Donnellon, Gray and Bougon (1986) show that organized action can occur despite differences of interpretation among organization members. They support Weick's (1979) notion that groups act and subsequently make sense of those actions, thereby creating shared meaning. Therefore, although interpretations may be dissimilar, the behavioral implications may be similar. They state that:

> organizational members have two alternative sets of organizing tools at their disposal: 1) shared meanings; and 2) shared communication mechanisms. If

> achieving shared meanings is neither possible nor practical, influential members can rely on their repertoire of shared communication mechanisms to create equifinal meanings consistent with their desired course for collective action. (p. 53)

Actions-Outcomes

The model suggests that individuals will take actions based upon their individual and collective interpretations of the environment. The collective interpretation, or organization schema, arises from the process of integrating. In cases where there is a low level of integration, actions taken by organization members will likely be fragmented and disjointed, since they are more representative of the individual's independent interpretation than of any shared understanding derived from the process of integrating. The actions themselves become stimuli in the environment, thereby contributing to its shape. These stimuli can be referred to as the outcomes, providing feedback for the organization if they have been interpreted by its members.

SUMMARY

In summary, the sociocognitive model in Figure 2.1 extends the conventional view of strategic management by introducing cognitive elements that provide insight into how organizations learn about their environment. The model identifies individual aspects of learning (individual schemas and the process of interpreting), and collective aspects of learning (organization schemas and the process of integrating). As well, the model incorporates processes of learning (interpreting and integrating) and products of the process (individual schemas, organization schemas and actions). While there has been a considerable amount of research on the behavioral and cognitive processes of interpreting. and a substantial body of literature on group processes of decision making, there is very little research which examines the mechanisms that facilitate cognitive integration of individual schemas. In addition, while there has been substantial research in the field of psychology on individual schemas, there has been scant research in the field of management. Research in the field of management that has examined organization schemas, has largely involved case based research which may be strongly affected by the researcher's bias about the nature of organization schemas. As a result, the conflicting evidence regarding the need for shared understanding to take concerted action, may be more attributable to researcher bias than to the phenomenon itself.

The following chapter further develops two of the cognitive elements of the model: individual schemas and organization schemas. The relationship between the potential level of interpretation of individual schemas and their subsequent integration is used to identify different types of organization schema. The model is applied to the issue of whether consensus on goals and/or means leads to better performance, demonstrating how a cognitive perspective can shed new light on issues in strategic management.

TABLE 2.1 TERMINOLOGY FOR COGNITIVE SCHEMAS

Anderson and Paine (1975)	Managerial Perceptions
Argyris and Schon (1978)	Theory of Action
Axelrod (1976)	Cognitive Maps
Barnes (1984)	Cognitive Biases
Bartunek (1984)	Interpretive Schemes
Bougon, Weick and Binkhorst (1977)	Cause Maps
Brief and Downey (1983)	Implicit Theories
Brunsson (1982)	Organizational Ideologies
Cowan (1986)	Cognitive Frameworks
Cyert and March (1983)	Screens: Bias in Search
Daft and Weick (1984)	Interpretation
Dearborn and Simon (1958)	Selective Perception
Dunn and Ginsberg (1986)	Frame of Reference
Dutton and Ducan (1987)	Attentional Fields
Dutton and Jackson (1988)	Issue Categories
Ford and Hegarty (1984)	Cause and Effect Beliefs
Cephart (1984)	Dominant Reality
Ginter and White (1982)	Shared Perspective
Gouldner (1971)	Domain Assumptions
Grinyer and Spender (1979)	Recipes
Hall (1984)	Organizational Cause Maps
Hambrick and Mason (1984)	Selective Perception
Hewitt and Hall (1973)	Quasi-theories
Isenberg (1984)	Overriding Concern
Janis and Mann (1977)	Quassi-satisfying
Katz (1982)	Functional Fixedness
Larwood and Whittaker (1977)	Self-serving biases
Lorsch (1985)	Strategic Myopia
March and Simon (1958)	Frame of Reference
Maryuma (1982)	Mindscapes
Mason (1969)	World View

Mason and Mitroff (1981)	Assumptions: Tunnel Vision; World View
Meyer (1982s)	Organizational Ideologies
Miles (1982)	Assumptions
Murray (1978)	Strategically Sensitive Blind Spots
Porter (1980)	Blind Spots
Prahalad and Bettis (1986)	Dominant Logic
Ranson, Hinings and Greenwood (1980)	Interpretive Schemes
Salancik and Porac (1986)	Distilled Ideologies
Sapienza (1985)	Shared Beliefs
Schons (1983)	Tacit Understandings
Shrivastava and Mitroff (1983)	Frames of Reference
Shrivastava and Schneider (1984)	Organizational Frames of Reference
Simon (1955)	Givens
Stagner (1969)	Personal Bias
Starbuck and Hedberg (1977)	World View
Steinbrunner (1974)	Grooved Thinking
Stevenson (1976)	Cognitive Perceptions
Turner (1976)	Collective Blindness
Vancil and Green (1984)	Myopia
Walker (1985)	Cognition
Walsh (1988s)	Belief Structures
Walsh and Fahey (1986)	Negotiated Belief Structures
Walton (1986)	Organizational Prototypes
Weick and Bougon (1986)	Cognitive Maps

WALSH (1989)

CHAPTER III

THE RESEARCH ISSUE: ORGANIZATION SCHEMAS AND PERFORMANCE

The sociocognitive model of strategic management, presented in Chapter II, extends the conventional notions of strategic management to incorporate cognition. Traditionally, the performance of the organization has been characterized as being dependent upon the fit between the organization's strategy and the internal and external environment. The rational perspective of strategic management, outlined in Chapter II, focuses on the fit between the content of the various elements, with no regard for the role of the individual. The information perspective takes the individual into account, but assumes that individuals will have the same interpretation of data or, as Weick (1979) states, "I'll believe it when I see it". From an information perspective, the key task is to obtain "the right information". On the other hand, the interpretive perspective suggests that individuals may have different interpretations of the same data. The underlying assumption of the interpretive perspective is, as Weick stated, "I'll see it when I believe it".

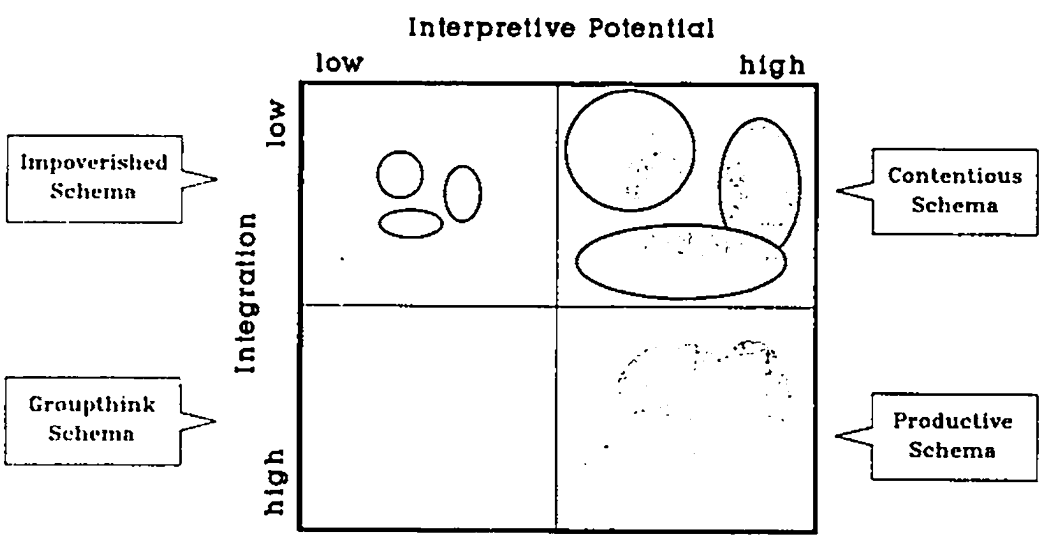
The sociocognitive model adopts an interpretive perspective through the explicit recognition of the role of individual schemas in guiding the interpretive process. However, the model's broader roots, derived from the concept of organization learning presented in Chapter I, are manifested in: 1) the recognition of individual aspects of learning (process of interpreting, and individual schemas) and collective aspects of learning (process of integrating, and organization schema); 2) the incorporation of processes of learning (process of interpreting, and process of integrating); and 3) the incorporation of products of learning (individual schemas, organization schemas, and actions).

In this chapter, the focus is narrowed to two of the cognitive elements of the sociocognitive model that were identified in Chapter II as being in great need of empirical examination: individual schemas and organization schemas. Four types of organization schema are proposed,based on a group's potential level of interpretation and integration of individual schemas. The four types of organization schema are used to provide insight into an issue that has been debated in the strategic management literature: Does consensus on goals and/or means lead to better performance? The issue was selected to demonstrate how a cognitive perspective can shed new light on issues that have been debated in the strategic management literature. This chapter begins with a discussion of the four types of organization schema, followed by a discussion of the consensus-performance literature, and its limitations in light of the insights gained from the sociocognitive model presented.

TYPES OF ORGANIZATION SCHEMA

As discussed in Chapter II, the organization schema is not necessarily represented by a complete overlap of individual schemas. This dissertation proposes that the organization schema can be categorized into four types based on the potential level of interpretation of the members' individual schemas and their subsequent level of integration achieved, as depicted in Figure 3.1. In other words, a high level of interpretation will only be realized if there is a high level of integration. For ease of discussion, references will be limited to high and low interpretation and high and low integration, on the understanding that interpretation refers to the potential provided by individual schemas and that integration refers to the level of integration achieved amongst the individual schemas. It is submitted that the potential level of interpretation is a function of the *complexity* of individual schemas and the *divergence* among them. Level of integration refers to the level of shared understanding amongst individuals in the organization.

FIGURE 3.1 TYPES OF ORGANIZATION SCHEMA



It is suggested that low interpretation and low integration will lead to an "Impoverished" organization schema, as no shared understanding exists and the individual schemas lack the complexity and diversity to interpret a complex environment. On the other hand, low interpretation coupled with high integration simply leads to a "Groupthink" schema. Individuals share a common understanding, but the understanding overlaps and lacks complexity, breadth and depth. However, if there is high interpretation and low integration, a "Contentious" schema arises. The Contentious schema is a set of diverse and complex individual schemas which are not integrated. Brunsson (1982) conducted case studies of major organization change or stabilities in seven organizations and concluded that "ideological inconsistencies increase uncertainty and make it extremely difficult to marshall commitments for organizational actions. Conflicts interfere with coordination." (p. 41) Finally, it is suggested that high interpretation coupled with high integration will lead to a "Productive" schema. The Productive schema is an organization schema that has integrated diverse and complex views into a shared understanding.

Level of Interpretation

Level of interpretation refers to the potential that exists within a group to interpret the environment. Earlier it was submitted that the potential level of interpretation is a function of the complexity of individual schemas and the divergence among them. It is expected that individuals with more complex schemas will be better equipped to interpret the complexity of the environment, and that individuals with diverse views will have the potential to interpret different aspects of the environment. Conversely, it is expected that individuals with low complexity and low diversity will have a low potential level of interpretation. The following section expands on each of these factors.

Schema Complexity

Schema complexity refers to the structure of the individual's schema. As stated in Chapter II, while research on individual schemas has been carried out in the field of psychology, there is scant research in the field of management. Therefore, drawing on the field of psychology, the research comparing the schemas of novices and experts provides valuable insights for management theory. In particular, from a management perspective it is expected that individuals with more complex schemas will be better able to interpret stimuli from the environment. Isenberg (1986) states that:

> The literature on the cognitive basis of expertise shows that the structure of knowledge is one of the key distinguishing characteristics of experts: their knowledge bases are both more extensive and more highly organized, both laterally and hierarchically, than those of nonexperts. In other words, the expert draws upon a vast store of concrete experiences and general rules, all of which are richly interrelated in a dense web of knowledge. (p. 253)

Drawing on research in cognitive psychology, Glaser (1990) suggests that proficiency and competence arise from the structure of an individual's schema. While novices seem to work on the surface features of a problem, experts draw on a more highly organized knowledge base to gain greater insight into the situation.

Chi, Feltovich and Glaser (1981) studied the categorization and representation of physics problems by experts and novices. Novices were represented by eight undergraduates in Physics while experts were represented by eight doctoral candidates in Physics. They found that the experts utilized the deep structure of the problem (underlying physics law) to categorize it, while novices focused on the surface features of the problem. They found little overlap between the expert and novice categories. Experts tended to categorize problems under several categories, suggesting that experts are able to see the underlying similarities in a great number of problems, whereas the novices see a variety of problems that they consider to be dissimilar because the surface features are different. The findings of Chi et al. were supported by McKeithen et al. (1981) who studied computer programming in 52 subjects at three skill levels. They found that expert programmers recalled more information at a glance than did novices. They suggested that experts organize information into more meaningful chunks.

Moving from the laboratory to the field, Lurigio and Carroll (1985) studied the schemas of 40 probation officers (PO). "Comparisons of the results by expert and novice POs demonstrated that schemata become more detailed, more meaningful, and better articulated with experience" (p. 1123). As well, Sujan, Sujan and Bettman (1988) studied 41 tele-marketing operators. They found that more effective salespeople had richer and more interrelated knowledge structures about the customer. However, they found no difference in the number of categories used to classify customers for more and less effective salespersons.

The foregoing laboratory and field studies provide strong support for the view that experts tend to have more complex schemas than novices. While the complexity of an individual's schema is expected to enhance his or her ability to interpret the environment, as found with experts, it may also have other ramifications as suggested by Kelly's (1955) related concept of cognitive complexity. Schema complexity is distinguished from Kelly's notion of cognitive complexity in that schema complexity refers to complexity about a particular domain. Kelly's cognitive complexity, derived from the theory of personal constructs, suggests that individuals are generally more or less cognitively complex, regardless of the domain. Cognitive complexity has been found to be positively correlated with accuracy in predicting behavior (Bieri, 1955). Bieri argues that cognitively complex individuals have the versatility to operate in both simple and complex behavioral realms and, therefore, the complexity or lack of complexity of the situation in which they find themselves will not hinder their performance. Abelson et al. (1968) reports on several studies that link cognitive complexity to the ability to process inconsistent information. They state that "there is evidence that the judge with more structure in his system of perceiving others (i.e., the more cognitively complex judge) will discriminate better among inconsistent stimuli, will prefer and be more certain of his judgments based upon inconsistent information, and will inject greater conflict into his judgments" (p. 640).

Bartunek, Gordon and Weathersby (1983), drawing on Kelly's concept of cognitive complexity, suggest differentiation and integration as measures of complexity. Differentiation refers to the range and depth of concepts or constructs, while integration refers to the relationship between concepts. Bieri (1955) state that "inasmuch as constructs represent differential perceptions or discriminations of the environment, it would be expected that the greater the degree of differentiation among the constructs, the greater will be the predictive power of the individual" (p. 263).

From a management perspective, many policy fiascoes have been attributed to the "cognitive shortcomings" of the TMT (Walsh 1988). In particular, deficiencies in managerial beliefs about cause and effect (cognitive schemas) have been instrumental in organization failure and crises (Ford and Hegarty, 1984; Hall, 1984). It is expected that individuals having a lower level of differentiation and/or integration may have more difficulty in interpreting critical environmental cues, thereby setting the stage for strategic blunders. For example, in Hildebrand's (1989) study on Mark's Work Wearhouse (MWW), a Canadian specialty retailer, she observed that MWW attributed its success in Canada to several factors that were considered transferable to the U.S. market. Consequently, they employed the same strategy in the U.S. as they did in Canada. However, several problems arose because of their misinterpretation of the environment and MWW pulled out of the U.S. market. MWW attributed their success to the fit between their product and their customers' needs, as evidenced by the steadily increasing sales in Western Canada to working people, whom they perceived as being predominantly farmers. They perceived farmers in the U.S. as being the same as Canadian farmers. However, they failed to recognize several other factors which contributed to their success, yet were not present in the U.S. market. In retrospect, it is apparent they did not recognize the role the Canadian government plays in stabilizing the agricultural sector, nor did they recognize the fragile buoyancy of the Western economy as a result of the oil boom. They did not recognize that the close ties they had with Canadian suppliers would be difficult to replicate in the U.S. as a result of more intense competition and the assumption of a new role as a "small fish in a big pond". It is suggested that MWW's failure to recognize many of these factors, in spite of having the "data" available, may be attributed to a lack of schema complexity about the business and to the inappropriate interpretation of the data as a result of the schemas they held.

The case studies of Fahey and Narayanan (1989), and Hall (1984), provide insight into the concept of schema complexity, although they use the organization rather than the individual as the unit of analysis. Fahey and Narayanan (1989) examined the changes in the revealed organization schema of Zenith over a 20 year period through the analysis of industry and government publications and studies, congressional hearings, and literature from the popular business press. They found that Zenith under-identified or missed environmental elements 29% of the time and over-identified elements approximately 67% of the time. They concluded that "the identification of environmental elements was far from perfect, and decision-makers display tendencies toward blindness (under-identification) and neuroticism (over-identification)" (p. 373).

Hall (1984) carried out retrospective analysis of the *Saturday Evening Post* over a 20 year period. He concluded that:

> in interpreting causality in its complex external environments, it appears that an organization is guided by its maps of causality. Where part of the map is missing, it does not perceive any relationship. As has been described, the policy elite of the old *Saturday Evening Post* seemed to be oblivious to the recursive relationships that tightly coupled readers, advertising sales and magazine pages....Whether the readership of their magazine increased or decreased, the same result was obtained, profits dropped. (p. 923)

In summary, the complexity of an individual's schema is expected to influence his or her ability to interpret critical environmental cues. The more differentiated and integrated the schema, the greater the likelihood the individuals will have greater insight into a particular situation.

View Divergence

The second factor, view divergence, relates to the differences in cognitive schemas among individuals on the management team. As suggested in Chapter II, using the analogy of the puzzle, individuals with different views about the environment hold different pieces of the puzzle, and therefore have the potential for a higher level of interpretation than individuals who share the same views. In some cases, diversity of views may be able to compensate for lack of individual schema complexity. For example, one individual might have a complex interpretation of the environment; however, many individuals who hold less complex, but diverse views, might have the same potential level of interpretation, if they are able to integrate their diversity.

There has been widespread recognition of the importance of view divergence. Friedlander (1984) suggests that organisms need differences or heterogeneity in order to learn: "the lack of differences within an organization or an individual results in lowered energy for learning" (p. 198). Drawing on Ashby's (1952) law of requisite variety, Fry and Pasmore (1984) suggest that organizations need to match the internal variety of the organization with the complexity of the environment. Variety refers both to a variety in skill or capability and variety in frames of reference. Moorhead and Neck (1989), building on Janis' (1972) model of factors that lead to "groupthink", support Janis' contention that homogeneity of group members is a precondition for "groupthink" - a mode of thinking often leading to poor decisions. Murray (1989) studied 84 Fortune 500 food and oil companies over the period 1967 to 1981. He hypothesized that heterogeneous or diverse management teams would facilitate adaptation, while homogeneous teams would interact more efficiently. Murray focused on heterogeneity of functional background and age rather than on cognitive heterogeneity. He found that management team heterogeneity was positively related to performance. Wanous and Youtz (1986) contend that view divergence in a group leads to diverse solutions and consequently, to higher decision quality. They studied 594 students divided into 98 ad hoc groups who had participated in the

Subarctic Survival and the Mountain Survival simulations. They found that diversity in the groups enhanced decision quality.

While there has been widespread support for the value of diversity, several researchers have argued that integration should not be sacrificed for diversity. O'Reilly (1986), in his study of 40 Fortune 500 firms, found that top management team homogeneity on age and length of service was positively correlated with both innovation and performance. O'Reilly argued that the need for integration in order to implement creative innovations outweighed the benefits of diversity. Mason and Mitroff (1981) argue for diversity in knowledge but interpersonal similarity in order to minimize conflict. Hurst, Rush and White (1989) suggest that:

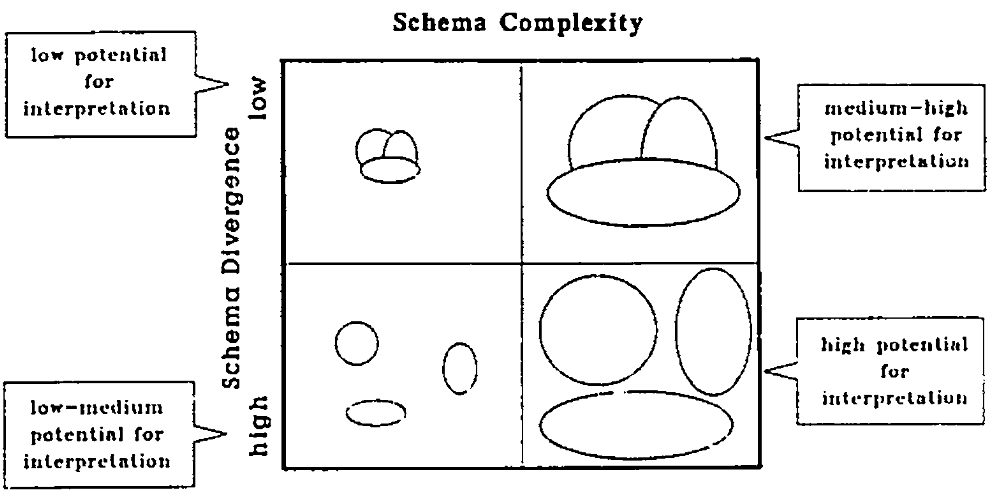
> Organizations capable of creating tomorrow's businesses while maintaining today's will require a diverse group of senior managers, able to perceive the world differently, yet able to participate in a process that transcends these different views to enact a complex organizational reality. (p. 88)

Hurst, Rush and White argue for both diversity and integration. This dissertation has suggested that the combination will lead to a Productive schema, whereas diversity without integration will lead to a Contentious schema.

Relationship between view divergence and schema complexity

The relationship between view divergence and schema complexity, as they relate to level of interpretation, is depicted in Figure 3.2. It should be clarified that while view divergence is a group phenomenon, schema complexity can be characterized as both an individual and a group phenomenon. The schema complexity of a group can be viewed as a composite of the potential that exists amongst the group members. The cells in Figure 3.2 refer to the schema complexity of the group. The size and density of the circles is intended to illustrate the dimensions of differentiation (size) and individual integration (density) of schema complexity. More highly differentiated schemas, containing more concepts, are represented by larger circles. More integrated schemas, containing more relationships between concepts, are shaded more densely. Therefore, high complexity is depicted by the larger densely shaded circles.

FIGURE 3.2 LEVELS OF POTENTIAL INTERPRETATION



Groups with high schema complexity and high view divergence are expected to have a high potential level of interpretation, since they collectively cover a broader array of constructs in greater depth than groups with low schema complexity and low view divergence. Schema complexity is anticipated to have a greater impact on interpretation than view divergence, since view divergence simply provides the potential to enhance the group's interpretation. There is no guarantee the individuals in the group will use the divergence in a constructive way. Therefore, groups high in complexity and low in divergence are expected to have higher potential interpretation than those high in divergence and low in complexity. However, complexity without divergence is risky, since it presumes that the collective schema is "correct".

In summary, four types of organization schema are proposed. These are based on the level of potential interpretation that exists amongst organization members, as a function of: their schema complexity and view divergence; and, the level of integration of the individual schemas as evidenced by the support and understanding that exists within the organization for the decisions made and the actions taken. The following section uses the typology of organization schemas to provide insight into a debate in the strategic management literature: whether consensus on goals and/or means leads to better performance, demonstrating how a cognitive perspective can provide insight into issues that have been debated in strategic management.

OVERVIEW OF THE CONSENSUS-PERFORMANCE ARGUMENT

A number of researchers have examined the relationship between TMT consensus on means and/or goals on the one hand and performance on the other (Bourgeois, 1980; Hrebiniak and Snow, 1982; Dess, 1987; Dess and Origer, 1987; Woolridge and Floyd, 1989; Priem, 1990). The purpose of consensus-performance research has been to determine whether organizations whose TMT's have some degree of consensus on strategic issues perform better than organizations whose TMT's do not have any such consensus. However, findings within and between studies have been inconclusive.

Performance has been measured by a variety of subjective and objective measures, while consensus has been measured as the *level of correspondence* among members of the TMT on the importance of factors associated with *means and goals*. Researchers have been divided whether it is more important to have consensus on strategic factors associated with means, goals or both.

The consensus-performance argument is rooted in two opposing views of strategic management. Bourgeois (1980) states that the "strategic planning school", with its normative planning models and rational-comprehensive approach to strategic decision making, requires that goals be defined before means can be assessed. In contrast, Bourgeois states that according to the "political-incremental" view of policy making, "goals are not necessarily either stabilized or agreed upon prior to the consideration of alternatives; rather, goals and means interact and adjust in light of what is currently feasible and politically acceptable" (p. 229). However, Priem (1990) states that "consistent with both the rational-normative and incremental-political literature, recent empirical researchers have uniformly hypothesized a positive relationship between TMT consensus and firm performance" (p. 469). In his extensive review of the literature, Dess (1987) concludes that "previous research has not consistently demonstrated either a positive relationship or a negative relationship between consensus on either goals, means, or both and organizational performance" (p. 261).

In his study, Dess examined the relationship between performance and the consensus of the TMT on goals and means for 19 firms in the highly fragmented paints and allied products industry. Dess argues that, although many substantive and methodological reasons could be advanced for the controversial and inconclusive findings of previous studies, the most salient limitation was the disregard for environmental heterogeneity. In other words, the different environments in which the firms operated could explain more of the inconclusiveness of the studies than substantive or methodological limitations. Although Dess hypothesized that competitive pressures in the industry he studied would lead to consensus on both means and ends, he found that consensus on either means or ends was positively related to performance.

Bourgeois (1980) studied TMT consensus on goals and means in 12 non-diversified public corporations. Personal interviews with the Chief Executive Officers were conducted to identify members of the TMT. Across the 12 firms, questionnaires were administered to 71 TMT members. Level of agreement on goals and means was determined by summing the standard deviation of responses among TMT members in each firm based on their assessments of the importance of 12 goal items and 23 means items. Contrary to what Bourgeois had hypothesized, he found that disagreement on goals and agreement on means had a positive and statistically significant relationship to economic performance.

Hrebiniak and Snow (1982) examined the relationship between TMT agreement on strengths and weaknesses of the organization and the performance of organizations in four industries. Two of the industries, automotive and air transportation, were intended to represent environments low in complexity; the other two industries, plastics/synthetic resins and semiconductors, were intended to represent environments high in complexity. In total, 49 organizations responded to the questionnaires. Respondents were asked to rate ten organizational functions as being a strength, a weakness, or neither. They found that TMT agreement on strengths and weaknesses was related to organization performance even when controlling for environment complexity.

Woolridge and Floyd (1989) took up Dess' (1987) challenge that "future research should delimit the conditions under which consensus is positively or negatively related to performance" (p. 275). They did so by developing propositions that compare synoptic and incremental processes with the scope, content and degree of consensus. They also suggest that consensus is a multi-dimensional construct that has a temporal dimension. Shared understanding and commitment were advanced as two dimensions of consensus. It was suggested that weak consensus would be evidenced by low shared understanding and low commitment, while strong consensus would be evidenced by high shared understanding and high commitment. High shared understanding and low commitment was described as "cynicism", while low shared understanding and high commitment was described as "well-intentioned, ill-informed". Woolridge and Floyd did not conduct an empirical test of their propositions.

Priem (1990) proposes a curvilinear relationship between an aggregate measure of consensus comprised of goals, means, and environmental perceptions moderated by environmental dynamism. He suggests TMT homogeneity, a formalized structure, and disagreement or cognitive conflict during the decision making process as antecedents of consensus that are positively related to the group consensus outcome. Priem states that "the optimum level of consensus, relative to performance, falls somewhere between perfect consensus and perfect diversity of opinion within the TMT" (p. 473), since too much consensus may be dysfunctional. As well, he proposes that in stable environments a high level of consensus will be associated with high performance, while in dynamic environments a lower level of TMT consensus will be associated with high performance. Therefore, environmental dynamism is proposed as a moderator of the consensus-performance relationship.

LIMITATIONS OF PREVIOUS STUDIES

While there is no doubt that the degree of consensus, as well as its subject matter (means, goals, or both), may have important performance-related ramifications, the major drawback of existing research has been its failure to examine the nature of consensus. Previous research has not distinguished among types of consensus relating to an Impoverished, Groupthink or Productive schema, since the level of correspondence (low view divergence) measure of consensus would likely classify each of the three schema types as having high consensus. Essentially, previous research does not take into account the timing of the consensus. This dissertation has suggested that having a high diversity of views can be beneficial at certain points. Failure to consider timing would suggest that TMT's with an Impoverished schema, having low view divergence, would be classified as having a high degree of consensus. As well, previous research does not take into account the nature of the consensus since it does not distinguish between a Groupthink and a Productive schema. For example, a short while ago, the big three North American auto makers seemed convinced that North Americans wanted big cars. Despite the high degree of consensus, their performance declined measurably. In explanation, rather than enhancing performance, their high degree of consensus may have in fact inhibited their ability to interpret the changing environment. The problem of "failure to recognize" has often been attributed to not having "the right information". However, Hildebrand (1989) suggests that, in many cases, managers have "the right information" but fail to interpret it. This dissertation has suggested that individuals with more complex schemas, as found in groups with a Productive schema, will be better equipped to interpret stimuli from the environment than groups with a Groupthink schema who have low schema complexity.

In support of Priem, the distinctions between consensus on means and goals may be misleading. From a cognitive perspective means and goals may be difficult to separate. At different levels of abstraction, what was defined as a goal may become a mean. For example, Matsushita's goal of making profits became a means to a different goal when in 1932 the company developed a new policy with three principal goals: to improve the living conditions of the people, to improve the general welfare of the society, and to advance the national interest.

However, in contrast to Priem, this dissertation suggests a positive relationship between integration and performance. Priem proposes a curvilinear relationship since he argues that a high degree of consensus may be counter-productive. This dissertation suggests that researchers need to examine the level of interpretation to determine whether the consensus is in fact counter-productive, since a high level of integration associated with high interpretation is associated with a Productive schema.

SUMMARY

This Chapter has further developed two elements from the sociocognitive model presented in Chapter II: individual schemas and organization schemas. Four types of organization schema were proposed based on a group's potential level of interpretation as determined by its schema complexity and view divergence, and on the subsequent integration of schemas as evidenced by the level of support and understanding the group has for the decisions made and actions taken.

The issue of the relationship between consensus and performance was discussed to demonstrate how a cognitive perspective can provide insight into an issue that has been debated in the strategic management literature. The view of consensus in previous research has focused on the degree of correspondence of responses about goals and means, and therefore has not distinguished among Impoverished, Groupthink or Productive organization schema. This dissertation suggests a different view of consensus. Two primary factors differentiate the perspectives. The first is that the nature of consensus, from a cognitive perspective, is dependent upon the level of interpretation the group brings to bear on the situation as determined by the individuals' diversity and complexity of views; therefore, diversity may be a valuable input into the decision making process. The second factor is that the nature of consensus is dependent upon the level of integration which captures the degree of support and understanding, not just upon the degree of correspondence of views. Although, Woolridge and Floyd (1989) suggest that theorists studying consensus and performance must examine the degree of support and understanding, no empirical examination of this reinterpretation of the meaning of consensus has been done. Although the primary purpose of the empirical portion of this dissertation is to determine whether there is any relationship between the four schema types and performance, such a test should provide further insight into the consensus-performance issue.

Although management theorists are becoming increasingly aware of the benefits of adopting a cognitive perspective, the methodologies to test the theories are not well developed. This dissertation, therefore, has two equally important agendas. The first is to test whether there are differences in performance between groups with different types of schema as depicted in Figure 3.1. The second is to contribute to the development of a methodology for cognitive research on management problems. The following chapter outlines the research design and methodology of the study and discusses the measurement of the constructs.

CHAPTER IV - THE STUDY:
RESEARCH DESIGN AND METHODOLOGY

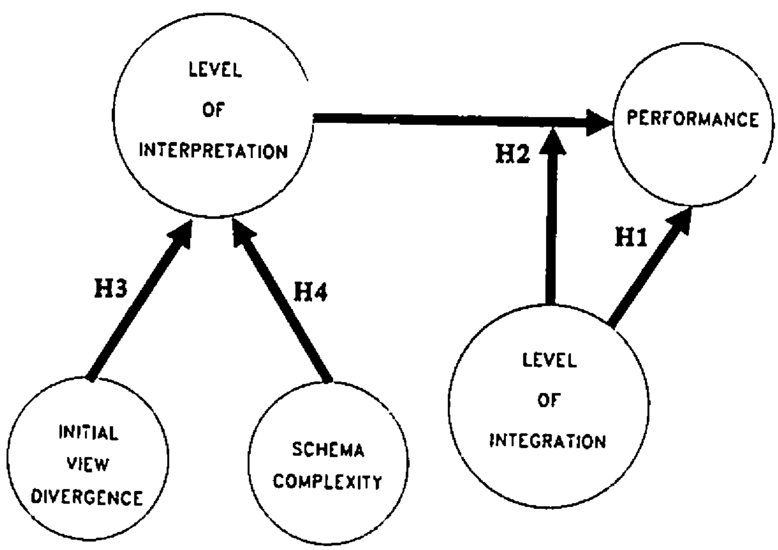
This dissertation's successive narrowing of focus was depicted in Figure 0.1 of the Introduction. Virtually any portion of the theories developed in the first three chapters could have served as a basis for the empirical portion of this dissertation. However, it is submitted that an examination of the theory presented in Chapter III provides the most appropriate starting point in a research program that will progressively broaden its focus, as discussed in the research agenda presented in Chapter VI. An empirical examination of the relationship between types of organization schema and performance responds to a number of needs that have been identified in this dissertation. Overall, it responds to the call for research employing a cognitive perspective. More importantly, it focuses on two areas that have received little attention: individual schemas and collective or organization schemas. Furthermore, an examination of the relationship between schemas and performance necessitates methodological developments which will facilitate further research employing a cognitive perspective. And finally, the results of the research should provide insight into the consensus-performance issue.

This chapter presents the research model used to examine the relationship between organization schemas and performance, as well as the hypotheses to be tested. The rationale for the use of a simulation is elucidated, followed by a presentation of the research design and methodology, and operationalization of the constructs used in the study.

RESEARCH MODEL

In Chapter III, four types of organization schema were proposed: Impoverished, Contentious, Groupthink and Productive. The categorization was derived based on the **potential level of interpretation** of the individual schemas and their subsequent **level of integration.** The level of interpretation of the individual schemas and their level of integration are the two main constructs in the research model as depicted in Figure 4.1. In Chapter III, **view divergence** and **schema complexity** were advanced as the two key sub-dimensions of the level of interpretation as depicted in Figure 4.1.

FIGURE 4.1 RESEARCH MODEL



It is expected that groups with different levels of interpretation and integration will have different levels of performance as will be discussed in the section on research issues and hypotheses presented below.

The research model focuses on the content of the individual schemas rather than on the process by which schemas are developed. Therefore, relating the research model to the sociocognitive model presented in Chapter II, the research model, examines the diversity and complexity of individual schemas regarding an individual's interpretation of the environment. As well, it examines the organization schema, based on the potential level of interpretation provided by the individual schemas and their subsequent level of integration. And finally, it examines the relationship between types of organization schema and performance. The research model does not examine the processes of interpreting and integrating. As discussed in Chapter VI, the processes have been targeted as part of a future research agenda.

RESEARCH ISSUES AND HYPOTHESES

The primary purpose of the empirical portion of this dissertation is to examine the relationship between types of organization schema and performance. Based on the level of interpretation and integration, four types of organization schema were proposed, as depicted in Figure 3.1.

More specifically, the following hypotheses were developed to compare groups with Impoverished, Groupthink, Contentious, and Productive schemas in order to determine whether there are any differences in performance which are distinguished on the basis of level of interpretation and integration. The following hypotheses were tested.

Hypothesis 1 - Integration and Performance

The first hypothesis relates to the nature of the relationship between integration and performance. It is expected that a high level of integration will be associated with higher performance. Integration in this discussion refers to the level of support and understanding organization members have for the decisions made and actions taken by the members. The need for integration was advanced in Chapter I when Barnard's (1938) concept of organization as the consciously coordinated activities of two or more people was introduced. As Barnard argues, it is the specialization and division of labour that gives rise to organization. Yet, the specialization and division of labour suggests there must be coordinating mechanisms so that the actions taken are internally consistent, thereby enhancing rather than detracting from each other. Taking internally consistent, or coherent actions, is facilitated by having a high level of support and understanding with respect to the decisions. However, individuals may take internally consistent actions without a high level of support and understanding, as was suggested in the case of the Abilene Paradox presented in Chapter II. Because of lack of communication and second guessing, individuals may take what appears to be coherent action that they individually do not support or understand. Therefore, there is something more to support and understanding than just internally consistent action. Having a high level of support and understanding suggests the likelihood of a process which enables individuals to present their views and resolve conflict. Therefore, it is expected that having a high level of integration, or support and understanding, will likely arise from a process that utilizes rather than suppresses different points of view, leading to a level of shared understanding that facilitates coherent action.

It is expected that groups with a high level of integration (the combination of Productive and Groupthink groups) will perform better than groups with a low level of integration (the combination of Impoverished and Contentious groups). In the research model shown in Figure 4.1, hypothesis 1 is depicted as the expected direct or main effect between **level of integration** and **performance**.

H1: Groups with high integration will perform better than groups with low integration.

i.e. Performance of Productive + Groupthink Groups > Performance of Contentious + Impoverished Groups

Hypothesis 2 - Interpretation and Performance

In Chapter III, it was argued that groups with a high level of interpretation, based on a high level of view divergence and a high level of schema complexity, have the potential to derive more meaning from environmental stimuli. The high level of schema complexity suggests that the schemas of the individual group members are highly differentiated, in that they contain many constructs, and highly integrated at the individual level, in that they reveal many connections between the constructs. It was argued that individuals with more complex schemas possess complex webs of beliefs that enable them to interpret and make sense of complex stimuli. The high divergence of views means that members of the group, having different schema, are likely to arrive at different interpretations of environmental stimuli. However, since interpretation refers to the **potential** that exists within the group, it is expected that the potential will only be realized if there is also a high level of integration. Without integration, it is likely that the individuals, having complex and diverse schemas will take disjointed actions rather than internally consistent actions, thereby detracting from rather than enhancing performance. Therefore, it is expected that groups who are able to integrate their complex and diverse interpretations will be better able to interpret their domain, and hence, to improve performance. However, if the group members are not able to integrate their diverse and complex views, it is expected that performance will suffer.

In Figure 4.1, hypothesis 2 is depicted by the intersection of the arrows from **level of interpretation** and **level of integration**. The interaction between the two constructs suggests that there will be no main effect for interpretation: that is, there is no direct relationship between **level of interpretation** and **performance**. Therefore, groups with a high level of interpretation will only perform well if they also have a high level of integration.

H2: Groups with high interpretation will only perform better than groups with low interpretation if they have high integration.

i.e. Productive > Groupthink
Productive > Impoverished
Productive > Contentious

When hypotheses 1 and 2 are read together, certain overall expectations become apparent. It is expected that Productive groups, having both a high level of interpretation and integration will be the highest performers, and given the importance of integration as argued in hypothesis 1, that Groupthink groups should have the next highest level of performance. However, it is difficult to form any definitive expectations about the relative performance of Impoverished and Contentious groups. Since both types of schema are characterized by a low level of integration, one might expect that the group with a higher level of potential interpretation should perform better. However, since there are two sub-dimensions of interpretation, they must be examined separately to determine whether the lack of integration affects both in the same manner.

Hypothesis 3 - View Divergence and Performance

The argument for integration, as stated in hypothesis 1, was partially based on the need to take internally consistent or coherent action. And it was argued that taking coherent action enhanced performance. However, it was also suggested that groups may take coherent action without having any support or understanding for doing so, often because of lack of communication or misunderstanding. However, coherent action may also arise in cases where there is low diversity to begin with. Therefore, groups with low integration and a low level of diversity will be more likely to be able to take concerted action in spite of their lack of integration, than groups having a higher level of diversity. It is expected that the disjointed actions of groups with higher view divergence will lead to poor performance.

H3: Groups with low integration and low view divergence will perform better than groups with low integration and high view divergence.

Hypothesis 4 - Schema Complexity and Performance

In contrast to view divergence, which requires integration to take concerted action, schema complexity may be less affected by the need for integration. As discussed in Chapter III, a high level of individual schema complexity indicates that the individual has a differentiated and internally integrated schema. Therefore, it is expected that in groups with low integration, groups with a higher level of schema complexity will be better equipped to interpret the environment.

H4: Groups with low integration and high schema complexity will perform better than groups with low integration and low schema complexity.

Hypothesis 5 - Frequency of Schema Types and Performance

The foregoing hypotheses have all referred to the expected performance of the various schema types based on the level of interpretation, including schema complexity and view divergence, and the level of integration. In addition to expectations about performance, there are also expectations about the ease of developing a Groupthink schema and the difficulty of developing a Productive schema. Since level of interpretation refers to the potential that exists within the group, all groups could be classified as being either Impoverished or Contentious, prior to having the opportunity for integration. If they are able to attain a high level of integration, Impoverished groups become Groupthink groups and Contentious groups become Productive groups. Therefore, even though groups with Productive schemas have been hypothesized to outperform all other schema types, it is important to know how difficult it is to develop a Productive schema. It is expected that the difficulty of integrating diverse and complex schemas will be evidenced by the fact that there will be more Contentious groups than Productive groups. A corollary is that it will be relatively easy to integrate schemas that are less diverse and complex and therefore there will be more Groupthink groups than Impoverished groups.

H5: There will be more groups with Contentious schemas than groups with Productive schemas, and more groups with Groupthink schemas than groups with Impoverished schemas.

i.e. # Contentious Groups > # Productive Groups
Groupthink Groups > # Impoverished Groups

The following section presents the research design used to test the 5 hypotheses.

RESEARCH DESIGN

Research Design Alternatives

Several alternatives were considered to test the research issues and hypotheses set forth at the outset of this chapter. An experimental design using a simulation was favoured over either a field study or a survey for several reasons as outlined below. There were three primary criteria for selecting a design. The first was that it should provide the best opportunity to test the hypotheses. The second was that it should provide the best opportunity to test and develop techniques for measuring the cognitive constructs. As stated in the Introduction and supported by Huff (1990), theories adopting a cognitive focus are outpacing methodologies to test them. The third was that the research design should preserve the relevance to the practice of management.

Survey Research

Although a survey could have provided access to a large sample, its primary drawback is that it does not allow the researcher to control the conditions under which the respondent completes the questionnaire. To test the hypotheses, the researcher needs to determine the point in the decision making process that cognitive schemas are measured, since it has been suggested that view divergence is preferable at the beginning of the process and consensus at the end of the process. As well, it is preferable to administer the questionnaire in the presence of the researcher to ensure that the resulting schema is not a collaborative effort. Furthermore, many methods for schema elicitation require interaction between the researcher and subject since there are several phases in the measurement process. Ideally, the schemas elicited should represent interpretations of the same environment for comparison purposes. Survey methodology, using a wide variety of companies, facing different environments, would make it extremely difficult to assess the comparability of schemas. As well, the difficulty of obtaining comparable performance measures for different companies weakens the reliability of the measure. And finally, survey methodology makes it difficult to rule out other influences on performance, particularly implementation.

Field Study

The *ex ante* bias of this researcher was to conduct case-based research of a small sample of companies in order to develop a rich description of the various types of organization schema. The strength of the field study approach is the measurement of cognitive schemas in a natural setting, providing the opportunity for a rich description of individual schemas and, organization schemas and of the processes of interpreting and integrating. Unfortunately, the significant drawback of a field study is the difficulty in establishing a link between level of interpretation and integration on the one hand, and performance on the other. It is not possible to control for the many factors, including implementation that may impact performance. Defining the environment in a field setting is extremely difficult, and obtaining comparability across firms is virtually impossible.

Experiment

An experiment allows the researcher to control for other factors which may influence performance. For example, it provides the opportunity to define the environment the respondents will encounter. The opportunity to control factors such as the environment and implementation enhances internal reliability, and therefore facilitates the testing of hypotheses. However, the strength of the experimental design is also its weakness; that is, the ability to control also creates artificiality since it takes the study of the phenomenon out of its natural setting. The degree of artificiality, however, is dependent upon the type of "experiment" chosen.

Conclusions

Survey research and a field study share the same primary drawback: the level of control they provide for schema measurement and other factors influencing performance make testing the hypotheses extremely difficult. A controlled setting offers the opportunity to test the theory and provides a setting in which additional data can be collected and analyzed with a view to further building the theory. It is recognized that in this context, theory testing and theory building are distinct phases of the study.

Since an experiment offers the opportunity to test the theory, and to develop techniques for measuring cognitive schemas, an experimental approach was used. The simulation discussed below minimizes the artificiality of the experiment and maximizes the potential to both build and test the theory.

Markstrat Simulation

The Markstrat simulation was used to test the relationships among the four types of organization schema, as defined by level of interpretation and integration, and performance. This section provides a brief overview of the suitability of the simulation for testing the hypotheses, developing techniques for measuring the cognitive constructs, and preserving the relevance to the practice of management.

The primary concern in any simulation is its external validity. In the introduction to a special issue of the *Journal of Business Research* devoted entirely to Markstrat, Cook (1987) states that: "One of the chief concerns about research expressed by many scholars not familiar with the Markstrat environment is summed up by the statement: 'It's only a game, what's it got to do with the real world?'" (p. 468). Several articles in the issue were devoted to responding to this question. Kinnear and Klammer (1987) conducted a study to determine whether managers with diverse industry experience perceive that Markstrat represents a real environment useful for teaching and research. They found that 93% of the respondents believed that Markstrat is a realistic simulation of competitive market forces. Larreche (1987) states that:

> It has been progressively realized that the Markstrat simulation was not only a marketing strategy game, but had the properties of a more general simulated environment laboratory. Its development was based on the integration of a diversity of known "microtheories" on market and competitive dynamics, rather than on the basis of its theoretical validity. Experienced business executives from diverse industries and countries have been exposed to the simulation and have found it to behave realistically. The positive feedback from experienced business executives over a 10-year period has established its behavioral validity." (p. 565)

Walsh et al. (1988) state that research using business simulations has enhanced the external validity of decision making research while maintaining internal validity.

Recently, Green and Ryans (1989) used Markstrat to examine entry strategies and market performance. They identified several advantages in using the simulation, including the controlled environment and the reduction in measurement error given identical calculation of a variety of measures, including performance, across firms. They state that: "The minimization of measurement errors meant the researchers were able to get more reliable and valid estimates of the relationships between the various constructs" (p. 21).

However, these claims for external validity must be placed into context. Markstrat is not the real world. And it is the factors which allow for control in the study which create artificiality. For example, the short decision time frame reflects only one type of decision process in the real world. However, Markstrat need not replicate reality to represent it. It is the level of interpretation and integration (schemas), not the process of interpreting and integrating, that is the focus of this study. Therefore, the determination of its external validity must be based upon whether individual and group interpretations of a particular environment affect their performance relative to that environment, and whether this relationship can be generalized to other environments.

Markstrat allows the researcher to control for implementation since the teams simply make decisions that they input into the computer. Although the teams must assess their own resources and capabilities in selecting a particular strategy, their performance is not dependent upon their actual ability to implement the strategy.

In Chapter III it was suggested that a limitation of previous research on consensus and performance is that researchers have not identified whether consensus (low view divergence as measured in previous studies) is an input or output in the decision process. Examining the temporal dimension of view divergence is essential to distinguish among the four schema types. In a field setting the temporal dimension would be extremely difficult to establish. In Markstrat there is a clear beginning and end to the simulation.

Although Markstrat was designed to test and apply Marketing strategy concepts, it incorporates variables from other functional areas, including Finance, Production, and Research and Development, and therefore offers the opportunity to simulate the types of decisions made in developing business-level strategy. Gatignon (1987) identifies the constructs and causal structure of the constructs in the Markstrat simulation. Table 4.1 presents a comparison of the factors identified by Gatignon and those used by Bourgeois (1980) to study the relationship between consensus and performance. A comparison of the factors illustrates that Markstrat, although a Marketing simulation, incorporates most of the factors that Bourgeois identified in his study.

One of the few management studies that has measured schemas also used Markstrat. Walsh, Henderson and Deighton (1988) used Markstrat to examine negotiated belief structures and decision performance. They examined the relationship between potential schema coverage, potential schema consensus, realized schema coverage and realized schema consensus on the one hand, and performance on the other. Individual schemas were elicited by having the subjects sort 46 factors related to marketing strategy development into piles of related factors. They were then asked to rank order the piles in terms of their importance for marketing strategy development. Individual differences multidimensional scaling was used to identify the structure of the individual schema. Potential coverage measured the degree to which individual schemas covered the identified domain. Potential consensus measured the similarity of the individual schemas. The realized values for coverage and consensus were weighted measures of the individual schemas based upon the influence patterns in the decision process. The results did not support their hypothesis that groups with high coverage and low consensus would perform better. The primary limitation of their study was that it did not provide a measure of individual schema complexity, nor did it measure level of integration. They argue that low initial consensus will lead to better performance because of the initial view divergence of the individuals. However, they did not measure whether the divergent views were ever integrated.

Although there are limitations in the Walsh et al. study, as it relates to the research issue defined in this paper, it provides strong support for the use of Markstrat to measure schemas. They state that "we are encouraged by the reliable measurement of the schema for marketing strategy development - the building block of the content of the negotiated belief structure.... We are also encouraged by the systematic relationships between the negotiated belief structure variables and decision performance that point to the validity of the construct" (p. 205). They also support Markstrat as a complex and realistic decision environment that enhances external validity of the study while ensuring control to maintain internal validity.

Two other positive features of the Markstrat simulation relate to the control issue. First, the goal of maximizing cumulative net marketing contribution is clearly defined at the outset of the game; therefore, the subject matter of the diversity of schemas is explicitly restricted to means. Secondly, all teams receive the same information, with only a limited amount of choice; therefore, the potential for not having the "right information" and for information search are minimized, restricting the emphasis to pure interpretation.

To examine whether Markstrat is an appropriate environment for examining all the hypotheses, and in particular, the impact of schema complexity, feedback was elicited from previous participants on what they believed were the game's key success factors (KSF's). In addition, the Markstrat instructor's manual and the student guide were reviewed to gain further insight. The instructor's manual identified the following 13 factors that recur as problem areas for the students:

1. Failing to purchase market research studies;
2. Experiencing difficulty in forecasting brand sales;
3. Taking too much risk;
4. Scattering resources;
5. Failing to prune the product line;
6. Underinvesting in research and development (R & D);
7. Analyzing the perceptual map superficially;
8. Over advertising for mature brands;
9. Concentrating on absolute rather than relative marketing investments;
10. Failing to integrate inflation in marketing decisions;
11. Discounting competitors when analyzing opportunities;
12. Deciding whether to imitate or innovate; and
13. Recognizing the impact of market maturity on new product introduction.

These problems, when combined with the KSF's identified by previous participants, suggest that the simulation is an appropriate vehicle for assessing the research issues of this study since the problems can be related to the schema complexity construct. For example, it is suggested that groups may carry out superficial analysis of the simulation's perceptual map because they lack the complexity in their own schemas to identify the factors that affect product positioning. Difficulties in forecasting brand sales are also expected to be related to schema complexity. Failure to purchase research studies is expected to be reflected in a low value placed on them in one's schema. It has been suggested that many groups are overwhelmed by the amount of information. This is expected to have the greatest impact in groups with low schema complexity, who do not have the frameworks required to sort through and integrate the information.

In summary, the Markstrat simulation maximizes the three considerations stated at the outset. It provides the best opportunity to test the hypotheses by providing a high level of control, thereby facilitating the development of testing instruments. It also enhances the external validity, and hence the relevance to the practice of management, through the realistic nature of the simulation.

Subjects

The subjects were business administration students: 260 in the first year of the graduate program (MBA's), and 138 in the third year of the undergraduate program (HBA's). The students' level of familiarity with each other closely approximates the familiarity of individuals working in groups in organizations. Although the results of studying managers rather than students would have a more general application, the MBA's in this sample share many of the characteristics of a management group having an average age of 27 with four years of work experience. Therefore, while they can not be considered a senior management group, they have developed a managerial orientation which sets them apart from the typical university student. Bateman and Zeithaml (1989) compare group decision making by college students to that of practicing managers. The two groups were found to provide similar results. Ford and Hegarty (1984) found a high level of agreement between the cognitive maps of a group of MBA's and a group of full-time practicing managers concerning the overall causality of context, structure and performance variables.

The HBA's were added to the sample to increase the sample size. It was recognized that they might provide different results, a factor that was explicitly tested and will be discussed in Chapter V.

Procedure

The 398 subjects represented four graduate and two undergraduate business classes. Within each class, subjects were randomly assigned to groups of four or five for the undergraduate classes and six or seven for the graduate classes. In total, there were 70 groups who participated in the week long simulation as part of a course requirement. Since they had no other classes at this time, they had the opportunity to concentrate their attention on the simulation.

The 70 groups were divided into 14 parallel industries. Each of the 14 industries consisted of five groups representing different companies in the industry. Within each industry there were two markets referred to as the Sonite market and the Vodite market. The Sonite market consisted of five different segments with three channels of distribution. While the Sonite market was a growing, yet fairly mature market, the

Vodite market was a totally new market, with no competitors at the beginning of the simulation. Each of the five groups within the industry began with a different set of products with different positions in the Sonite market. However, each of the groups had an equal 20% share of the market. Because the simulation was interactive, decisions made by one group within the industry affected the other four groups. There was no interaction between industries.

The simulation operated over nine decision periods. The groups were given a schedule of the time and date to submit each set of decisions to the coordinator. Decision-making for each period generally took two to three hours. After submitting their decisions for each period, the groups waited for the results of their decisions before making decisions for the next period. The types of decisions the groups were faced with included decisions about: adding, dropping and repositioning products within segments; allocating resources to advertising, sales force and R&D for various products; assigning the sales force to different channels of distribution; deciding on specifications for R&D projects; and selecting prices for various products, as well as the number of units of each product to be produced. The allocation of resources was made within the budget each group received. The budget was based upon the group's performance in the previous decision making period.

As part of this research, individuals completed one questionnaire at the beginning of the simulation and two questionnaires at the end of the simulation, as will be discussed in further detail in the sections that follow. Five groups were video-taped for the entire decision making process. Forty groups were video-taped at the end of the simulation when they were asked to make presentations to "future management" about the strategies they had followed and their plans for the future.

OPERATIONALIZATION OF CONSTRUCTS

Since the measurement of individual schemas is a central aspect of this dissertation, the following section begins with a discussion of the different approaches to schema measurement. The approach selected is then discussed, and the measures of the various other constructs presented. Since there are no well-developed measures of the cognitive constructs, multiple measures were used.

Cognitive Schema Measurement Approaches

Even though the importance of cognitive schemas has been widely recognized, there have been few empirical examinations of schemas (Huff 1990). In Chapter II, schemas were defined as the web of beliefs that guide action. Operationalizing this definition and obtaining a measurement of schemas is a challenging task. Given the research issues in this study, there were two somewhat competing considerations in developing a testing instrument. While it was important to capture the complexity and individuality of individual schemas, it was also important that the schemas allow for comparability across individuals, to obtain a measure of view divergence. The following section discusses the various approaches to schema measurement. In the following discussion the terms "measuring" and "mapping" are used interchangeably.

Gray, Bougon and Donnellon (1985) suggest that measures of a cognitive map or schema should "consider all types of relationships possible in a network (e.g., continuity, proximity, contiguity, resemblance, implication, and causality)" (p. 86). However, most measures of schemas capture only a few of the relationships suggested by Gray et al. Huff's (1990) book, *Mapping Strategic Thought*, provided a much needed synthesis and description of different methods of measuring schemas and their uses. Huff identified five cognitive mapping methods that she placed upon a continuum based on the complexity of the measure. At one end of the continuum are maps that assess the attention given to a concept, the association between concepts, and the importance of concepts. The maps are constructed by taking an inventory of concepts and their relationships as found in written documentation such as annual reports and speeches. Further along the continuum are more complex maps showing hierarchical relationships and categories. Rather than deriving the maps from written documents, maps showing categories generally require collaboration by the respondent to generate the map. A third type of map, called the "cause map", focuses on causal relationships. Huff identified a fourth, more complex type of map, which shows the structure of arguments, and a fifth type which tries to uncover underlying perceptual codes and mental frameworks that are not accessible to the individuals involved. An excellent example of this fifth type of mapping method is Barley's (1983) ethnosemantic study of a funeral home in which he uses semiotics (the study of signs or systems of signs) to "elucidate rules by which members of a work culture consistently and coherently generate meaning" (p. 393).

This dissertation measures the type of schema referred to as the cause map. Given the research issue and hypotheses, the cause map was considered to be the most appropriate measure. In terms of Huff's continuum, cause maps provide a relatively high degree of complexity, while also enabling the researcher to obtain and compare the schemas of a large sample. It would be extremely difficult to obtain and compare individual schemas derived from more complex measures such as argument mapping or uncovering perceptual codes.

Walsh (1989) used a different classification than Huff, categorizing the major approaches to measuring cognitive schemas into eight groups depending upon: 1) whether the subject was aware of the behavior assessment; and 2) whether the subject, the researcher, or both had primary control over the observation and recording of behavior. The eight approaches and the theorists who have used them, as defined by Walsh, are shown in Table 4.2.

The cause map used in this dissertation falls under Walsh's self report measure classification since the subject was aware of, and had primary control over the process. Walsh identified several types of self report measures including: 1) Bougon's Self-Q methodology, where the subject generates constructs through a self-questioning process that helps the individual to identify the most important constructs relative to a particular domain; 2) Means-End analysis, where the subject generates a cognitive map of cause-effect relationships by filling in the cells of a matrix to identify whether there is a relationship between the constructs listed on the vertical and horizontal dimensions of the matrix; 3) Repertory Grid method, where the subject identifies similarities and differences between sets of elements selected from a particular domain; 4) Object Sorting, where subjects sort elements into similar categories from which key constructs are inferred; and 5) Pairwise Comparisons, which is a method similar to repertory grid, with the exception that elements are compared in pairs rather than triads.

Dunn and Ginsberg (1986) suggest a sociocognitive network methodology to organization analysis. They criticize the few studies that have examined cognition for relying on "soft" measures that are not easily reproduced, failing to recognize the heterogeneity of individual schemas within organizations, and paying insufficient attention to the communication activities through which shared interpretations develop. Since this dissertation focuses on the content of schemas rather than the process of interpretation, it does not address Dunn and Ginsberg's third criticism. However, it directly addresses the first two criticisms through the development of replicable "hard" measures, as will be discussed below, and the recognition of the heterogeneity or diversity of schemas which is central to the theory that is being tested.

Finally, a question needing to be addressed is whether cognitive schemas in general and cause maps in particular are representative of how individuals think, or whether they simply represent a useful tool for studying cognition. Huff (1990) argues: "At the least, pictorial representations are a useful device for summarizing and communicating information. More expansively, it is possible to point to a good deal of evidence that individuals do encode some information as images rather than words" (p. 14). Although Huff states that the conservative approach is to treat the map as a tool, she states that: "we can hope to capture something that has the same essential characterisitcs as thought itself. In this view, the mental map is the knowledge that subjects use themselves. Even if current maps fall short of this ideal, we are closer with cognitive mapping to understanding intentional choice than we have been before" (p. 14). In support of Huff, this dissertation views the cause map as a tool to capture an individual's beliefs about a particular domain. However, this is not to suggest that the beliefs that an individual articulates, or in this study draws as discussed below, are the only beliefs to guide his or her behavior. Rather, this subset of beliefs, those which can be communicated, are important since they guide an individual's behavior as well as the behavior of others, since they are the beliefs that are manifested to others in the organization.

Instrument for Eliciting Individual Schema

Means-End analysis was favoured over the other self-report methods listed in Table 4.2 for several reasons. In a pre-test using the Repertory Grid method, the respondent was asked to compare and contrast nine elements, which included the respondent's organization and eight of his competitors in the convenience store industry. The identification of similarities and differences became the constructs relating to competitive advantage in the industry. The respondent was then asked to rank, on a five point scale, the extent to which each construct characterized each element. For example, "narrow selection of products" was a construct shared by both chain convenience stores and "mom and pop stores" which differentiated them from grocery store chains. However, "mom and pop" stores were considered to have a narrower product line than chain convenience stores. Although the respondent identified more than 20 constructs, he indicated that he did not find the task as challenging as the means-end method that was also employed. As a result, the elicited schema appeared to be at a high level of abstraction. As well, the methodology does not provide for an examination of the relationship between constructs. Pair Wise Comparisons and Object Sorting have some of the same deficiencies as the Repertory Grid method since they both rely on a set of pre-determined objects, elements or factors which the respondent is asked to compare or sort.

The Self-Q technique which is closest to the Means-End analysis may be awkward. Respondents are asked to question themselves about a particular domain of interest. Through the process of questioning, constructs are elicited. It was felt that this type of methodology would not be effective in either eliciting or comparing schemas across a large sample.

In several pre-tests, the face validity of the Means-End was supported by the respondents who found the task to be meaningful and challenging. Means-End analysis has been used by several management researchers. It has been used by Bougon, Weick, and Binkhorst (1977) to study the schemas of a jazz orchestra, by Ford and Hegarty (1984) to study schemas about organization structure, and by Conrath, Montazemi and Higgins (1987) to study the evaluation of information by 10 district claims managers in an insurance company. The product of the Means-End analysis is a cause map.

Elicitation of the cause map

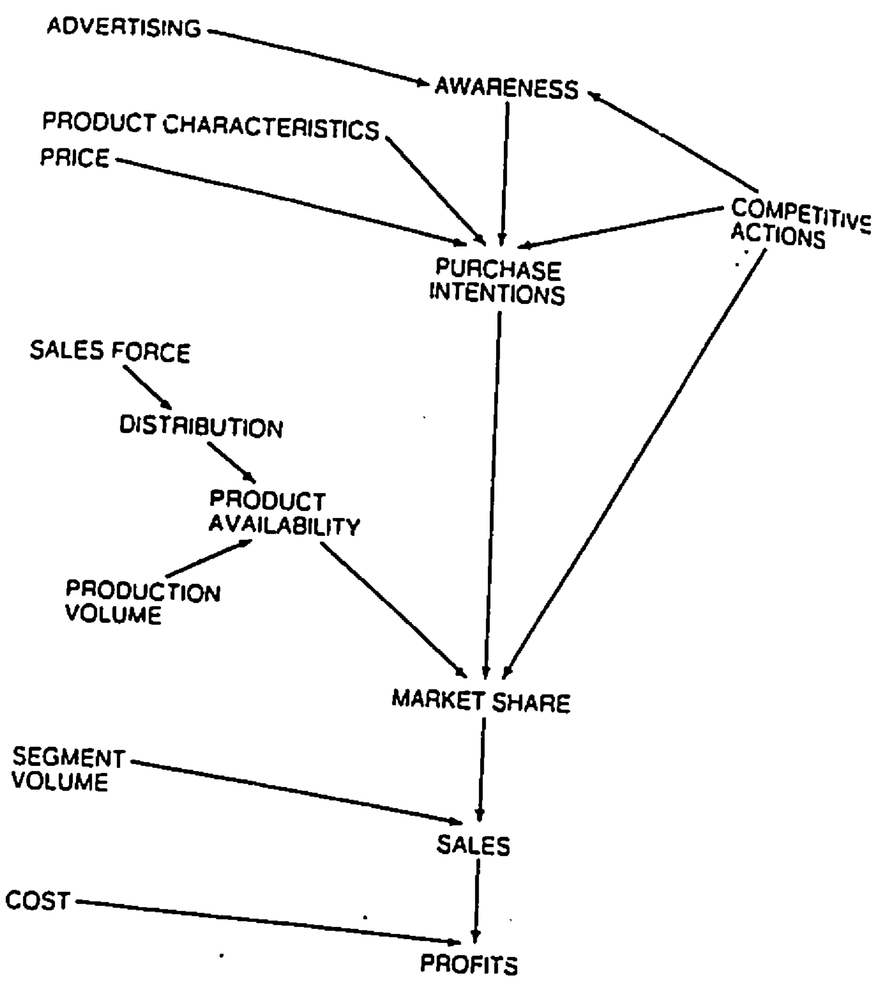
There are two primary tasks in eliciting a cause map: 1) identifying the factors or constructs; and 2) identifying the relationships among constructs.

Two approaches may be used for identifying the constructs: 1) free-form; and 2) fixed-form. In the free-form approach respondents identify the constructs leading to success in the Markstrat environment. Once they have recorded the factors, they are asked to identify any factors, not already mentioned, which affect the first set of factors identified. The pre-test indicated that three rounds led to an exhaustive list of factors for the respondent.

A second method of identifying constructs is to use a fixed-form approach. In this approach, the respondent chooses from a list of factors presented by the researcher. In the case of Markstrat, the developers of the simulation have constructed a cause map identifying the key constructs and relationships as shown in Figure 4.2.

The primary value of the fixed-form approach is that it facilitates comparison of individual schemas. In the free-form approach, the researcher has to make judgements about different uses of language. For example, if one respondent used the term "sales force" and another used the term "distribution", it would not be clear whether they represent the same construct or whether the terms demonstrate different levels of abstraction. The fixed-form approach minimizes discrepancies arising from language since respondents use the same terminology. As well, the fixed-form approach minimizes task induced variability, since the task is more clearly defined, thereby reducing second guessing about the nature of the task. That is, individuals will be more likely to draw maps at the same level of abstraction given the cue they receive from the list of factors. For example, without the cue from the list of factors, one individual might draw a map with only eight factors while another might draw a map with thirty-five factors. Further analysis would have to be conducted to determine whether the maps represent different levels of schema complexity or merely different levels of abstraction. However, a drawback of the fixed-form approach is that it introduces researcher bias since the constructs have been pre-selected. In addition, it may reduce the variability in the elicited schemas, since it is expected that most individuals will attempt to incorporate all constructs into the map. It is expected that the primary difference in individual maps will be the number and strength of relationships among constructs. Ideally, the free-form approach could be followed by the fixed-form approach. However, given the time-constraints on the subjects, only one approach could be used.

FIGURE 4.2 MARKSTRAT CAUSE MAP



Identifying relationships between two constructs can be accomplished in two ways. One approach is to place the factors on an x by x matrix and have the respondents fill in the matrix by identifying whether there is a positive, negative or no relationship between two factors. Additional coding, for example using a Likert scale, can identify the strength of the relationship between two constructs. While this approach captures the data in a form that can be analyzed easily and manipulated statistically, it is tedious and time-consuming for the respondent. For example, if 30 constructs were elicited, the respondent would have to analyze a 30 by 30 matrix, containing 900 relationships, to identify only a fraction as having a direct relationship. In a pre-test the respondent admitted that he had made several errors because of the tediousness of the process. The admission required the researcher to review all relationships to ensure the respondent had recorded what he had intended to record. In this approach, the matrix should be converted into map form for verification by the respondent. A second approach is to have the respondent draw a cause map directly from the list of elicited factors. Although this method would require additional coding by the researcher to convert the maps into matrix form for analysis, it is less time-consuming and tedious for the respondent. As well, since the data is in map form, there is no need to return to the respondent at a later date for verification. In light of the time constraints on the subjects in this study, the second approach was followed.

In summary, it was decided to use the fixed-form approach whereby the subjects chose from a given list of factors to actually draw the cause map. This approach facilitated cross-case comparison and minimized the errors that might arise if the respondents filled in a matrix of relationships instead of drawing the map directly.

Respondents were also asked to identify on the map, using a five point Likert scale, the strength of the relationship between any two constructs.

A separate task was designed to have the respondents rank order the importance of each of the constructs. The more traditional ranking task was used as a point of comparison for the results obtained from the cause map. The combined task of drawing the cause map and ranking the constructs took approximately 45 minutes. The 45 minute time frame also aided in obtaining cause maps at the same level of abstraction. Had the subjects completed the task on their own, some might have taken five minutes while others might have taken two hours. A sample of the first questionnaire indicating the two tasks is provided in Appendix 4A.

Level of Interpretation - Schema Complexity

The cause map was used to measure schema complexity. As previously discussed, theorists have suggested differentiation and integration as measures of schema complexity. Differentiation was operationalized according to the number of constructs the respondent used in the cause map, while individual integration was operationalized as the number of relationships between constructs. The greater the aggregate number of constructs and relationships, the greater the level of individual schema complexity. The group score for the number of constructs and the number of relationships was calculated as the average of the individual scores. The average of the z-scores (used to standardize the measures) for the two group measures was used to obtain an overall measure of group schema complexity. Since there are no objective norms to identify groups with high and low schema complexity, the median level of complexity was used as the demarcation between groups with high and low complexity.

Level of Interpretation - View Divergence

Four measures of initial view divergence were taken:

1) view divergence on the rank order of importance of the constructs;

2) view divergence on the structure of the cause maps;

3) view divergence on the structure and strength of relationship between constructs in the cause map; and

4) a self-report measure taken at the end of the simulation asking each respondent to indicate the degree to which they initially shared views with each of the other members of the group.

The first measure of view divergence was derived from the responses to the task in the first questionnaire which asked respondents to rank order the importance of 18 factors. The factors were the same as the list of factors from which they had selected the constructs for the cause map. The second and third measures were derived from the cause map. View divergence on the structure of the cause map was derived by analyzing if individuals agreed on whether a relationship between constructs existed. The significance of the relationship was ignored. View divergence on structure and significance incorporated differences on the significance of the relationship. The fourth measure was derived from the task in the second questionnaire (Appendix 4B), administered at the end of the simulation, which asked respondents to report on the degree to which they shared views with each member of the group at the beginning of the simulation using a five point Likert scale.

In order for the researcher to calculate the view divergence on the cause map, each cause map had to be transposed into an 18 by 18 matrix which indicated whether there was a relationship between constructs (number greater than zero), and the strength of the relationship (a number from one to five, five indicating a very strong relationship). A zero indicated that there was no relationship.

For the first three measures of view divergence, view divergence between each pair of individuals in the group was calculated by summing the absolute differences between the rank of each factor in the ranking task; and, for the cause map by summing the absolute differences between each cell of the 18 by 18 matrix. The group score was calculated as the average of the paired scores for the group. The lower the score, the more similar the schemas and the lower the view divergence.

The fourth measure of view divergence, derived from the self-report data in the second questionnaire, was calculated as the average level of shared views reported by individuals in the group. With this measure, the higher the degree of shared views, the lower the view divergence.

To obtain an overall measure of view divergence, it is necessary to analyze the dimensionality of the measures to determine whether they in fact measure the same construct. It was decided that if the measures were not uni-dimensional, they would remain as separate measures of view divergence. An analysis of the dimensionality of the measures is provided in Chapter V. Again, since there are no established norms, the median level of view divergence was used to demarcate groups with high and low view divergence.

Level of Interpretation

The measures of level of interpretation for the group was calculated as the average of the group z-scores for schema complexity and view divergence. Therefore groups with high schema complexity and high view divergence had a high score on level of interpretation. The median score was used to demarcate groups with high and low interpretation.

Influence

Since some group members might be more influential than others, the diversity and complexity of the group could not simply be measured as an average, but had to be obtained using a weighted average based on the level of influence. Although theorists such as Cartwright and Zander (1968) have developed theories of influence in groups that identify the characteristics of influential individuals, they conclude that one individual has influence over another individual if the actions of one cause a change in state of the other. Therefore, in this dissertation, influence is measured from the perspective of the respondent rather than through the use of objective measures of influence. Measures of influence and involvement were obtained in the second questionnaire, which asked respondents to report, using a five point Likert scale, the degree to which each member of the group: a) influenced the group; b) influenced the respondent; and c) was involved in the simulation.

Walsh, Henderson & Deighton (1988) examine the influence patterns around decisions to weight the impact of individual schemas. They suggested that the more an individual is involved in group discussions, the greater the weight his or her schema should receive in assessing its impact on performance. Therefore, if an individual had a complex schema, but failed to get involved in the group, the schema would receive a zero weight. Walsh et al. examined the differential impact of potential schemas (unweighted average) versus realized schemas (weighted average) on performance. They found realized schemas to be better predictors of performance.

In a pre-test, the constant sum method, employed by Walsh et al. (1988), where each subject estimates the contribution of their team mates by allocating 100 participation points, was used to obtain measures of influence and involvement. However, the respondents found this method extremely cumbersome and of questionable accuracy. Therefore, a five point scale was used in the Markstrat study to obtain measures of influence and involvement. It was emphasized, to the respondents, that the information was completely confidential and would not influence their grade in the course, or standing in the program in any way. Inter-rater reliability was examined to determine level of agreement among members, as will be discussed in Chapter V. Responses to the questions of influence and involvement were analyzed to determine whether there was any significant difference between the constructs. While Walsh et al (1988) used a measure of involvement to weight schemas, this dissertation suggests that level of influence is a more appropriate measure. From a cognitive perspective, it is not an individual's level of activity (involvement) that determines whether or not his or her perspective is embodied in the decisions made by the group, but rather the influence an individual has, regardless of his or her level of activity. In other words, in developing an organization schema, individuals who have high involvement but no influence, as reported by members of the group, will have little impact on the organization schema that arises. Furthermore, individuals may not have a high level of activity or involvement, but have a high degree of influence.

Level of Integration

Three measures of integration were obtained:

1) A self-report measure of integration was obtained as part of the second questionnaire (Appendix 4B) by asking each respondent to indicate, on a five point Likert scale, the degree to which they shared views which each of the other members of the group;

2) A measure of the degree to which group members supported and understood the decisions made by the group, using a four item, seven point Likert scale ranging from strongly disagree to strongly agree, was obtained as part of the questionnaire shown in Appendix 4B. The four item scale is as follows:

   i) So far, I have not supported most of the major decisions made by my group;

ii) I have found myself in opposition to the decisions made by my group;
iii) I definitely concur with the major decisions made by my group; and
iv) I understand the rationale for the major decisions made by my group.

3) An objective measure of the variability in the final cause maps and ranking was obtained from the cause maps and rankings elicited at the end of the simulation, using the same task as was described for the initial cause maps. The questionnaire is shown in Appendix 4C.

For the first two measures of integration, a group score was obtained by taking the average of the individual scores. For the third measure, the same technique was used, as was described for the measure of initial view divergence.

Although this study was not intended to focus on the process of integrating, a seven item, seven point Likert scale measuring the process of integrating was constructed to explore its relationship with the other measures. The implicit theory underlying the scale is that a process accessing and synthesizing the schemas of group members would likely lead to a higher level of support and understanding for the decisions, and also to better decisions, since it would maximize the potential interpretation that exists in the group. The seven item scale is as follows:

i) Our group discussions have been quite productive;
ii) Our group members listened carefully to each others' ideas;
iii) In my opinion, we have made the most of each group member's skills and abilities;
iv) Our group has had difficulty integrating everyone's perspective;
v) One of our problems has been that members of the group do not cooperate;
vi) Our group has developed an effective synthesis of all viewpoints; and
vii) In our group, decision-making has often been dominated by a few individuals.

The group score for the process measure of integrating was obtained by taking the average of the individual scores.

For the three measures of integration and the measure of the process of integrating, high and low levels were determined using the median as a demarcation point.

Performance

Cumulative net marketing contribution (cnmc) was used as the measure of performance. All groups were measured on the same basis, thereby providing a consistent and comparable measure of performance. Furthermore, since the goal of maximizing cnmc was clearly recognized as the objective of the simulation, there was no ambiguity about the measurement. Although each team began with an equal 20% share of the market, they began with different products, having different positions and levels of consumer awareness in each market segment. Therefore, an analysis of cnmc by start position was conducted to determine whether there was any effect on performance. The results of this analysis are presented in Chapter V. Summary statistics for each of the measures is provided in Table 4.3

TIMING AND PHASES OF THE RESEARCH PROGRAM

Phase 1 - Pilot study

A pilot study was conducted involving 96 first year business students, representing two classes who participated in the simulation game "Subarctic Survival". The students were randomly assigned to 18 groups of four to six students.

Procedure

The Subarctic Survival exercise presents participants with the situation of a small aircraft that has been forced to make an emergency landing in the subarctic, in an area which is off the course from the flight plan, and approximately 50 miles from the nearest town. Only 15 items were salvaged from the wreckage of the plane. None of the survivors has been injured.

Prior to meeting in groups, the participants are asked to rank the 15 items in order of importance for their survival, with a 1 indicating the most important item. The individual ranking task took approximately 15 minutes. They then met with their groups, and had approximately 35 minutes to develop a ranking for the group. They were advised to try and arrive at a consensus, rather than resorting to methods such as voting, or making trade-offs between items. Finally, the individuals were asked to complete the questionnaire shown in Appendix 4D which included a final ranking of the 15 items, as well as scales that measured influence and integration. The task took approximately 20 minutes. The questionnaire shown in 4D is a completed questionnaire which demonstrates the difficulty the respondent had in completing the task that measured the level of influence of group members, as was previously discussed. The respondents were then given the expert's ranking which they used to determine the level of divergence from: 1) their initial ranking; 2) the group ranking; and 3) their final ranking.

<u>Construct Measures</u>

Data analysis was conducted on one class representing 41 students divided into 8 groups. View divergence, integration, influence, and a proxy for schema complexity were measured and compared with performance rankings.

Since there was no opportunity to capture an individual's cause map relative to the simulation, the sum of the absolute deviations between the individual's initial ranking and the ranking of the expert was used as a proxy for schema complexity. That is, the closer an individual's score to the expert's, the more complex his or her schema should be. Group scores were calculated as the average schema complexity of its members. The scores for group schema complexity ranged from 28.5 (high complexity) to 60 (low complexity).

View divergence was calculated as the absolute sum of the differences in initial ranking for each pair of individuals in the group. The group score represented the mean of the paired scores. The group scores ranged from 37 (low view divergence) to 60.6 (high view divergence).

To measure the level of influence, the constant sum method employed by Walsh et al (1988) was used. Respondents were asked to allocate 100 points amongst the members of their group, including themselves, according to the degree to which the group member: 1) influenced the group; 2) influenced the respondent; and 3) were involved in the simulation. As previously indicated, the respondents had a great deal of difficulty with this task and therefore it was modified in the Markstrat study. A Kendall's Coefficient of Concordance was calculated for each group to determine the inter-rater reliability of ratings. The average Kendall's W statistic was .62, with seven of the eight groups significant at the .05 level and all eight significant at the .10 level, indicated high inter-rater reliability.

Level of integration was measured in three ways. The first was a measure of final view divergence, which was calculated in the same way as the initial measure. View divergence at the end ranged from 12.3 (high integration) to 43.5 (low integration). The second measure of integration was a three item, five point Likert scale which measured level of agreement, understanding and support for the group ranking. The third measure was a self-report measure obtained from the questionnaire which asked respondents to indicate the degree to which they shared views with each member of the group. A nine item, six point Likert scale was used to measure the process of integrating. The absolute sum of the deviation between the group's ranking and the expert's ranking was used as a measure of performance. Measures of performance ranged from 2 to 52. The analysis indicated that:

1. The weighted measures of schema complexity and view divergence did not change the classification of groups as having an Impoverished, Contentious, Groupthink or Productive schema.

2. Stepwise regression - using performance as the dependent variable, and using schema complexity, view divergence, and integration as the independent variables - indicated that integration was the only significant variable with an R square of .70 and a significance of .01

3. The nine item scale on the process of integrating yielded a two factor solution in an orthogonal factor analysis. When divided into two scales based on the two factors, the first scale had a Cronbach's alpha of .76 while the second scale had an alpha of .65.

The conclusions reached as a result of the pilot test were that the measurement instrument for level of influence and involvement needed to be modified, but that the weighted measures might not affect the results as expected, since the pilot test indicated no difference in classification of groups based on the weighted measures. As well, modifications were made to the integration scale to improve reliability. And finally, while integration was clearly a significant predictor of performance, neither view divergence nor schema complexity yielded the expected effects. However, both measures were based on a ranking task, rather than on the cause maps that were used in the Markstrat simulation. The following section discusses the second phase of the process in which a pre-test was conducted on the cause maps.

Phase 2 - Pre-test of cause maps

The procedure for eliciting an individual's cause map, in a Marketing context, was pre-tested on first year university students and several managers. The pre-test provided feedback on the efficiency and effectiveness of the procedure, the timing, and on the potential variability in schemas.

There was substantial variability between the cause maps of first year business students and practicing managers. In fact, many of the constructs were unfamiliar to the first year students who had taken only one course in business. The students had a great deal of difficulty in completing the task and their cause maps showed a lack of complexity as defined by the number of constructs and relationships identified. While there were similarities in the maps of practicing managers, there was also variability in the complexity of the maps. The pre-test provided support for the face validity of the task. The students, who could be viewed as novices, had cause maps with low complexity; managers, who could be viewed as more expert, showed more complexity in their cause maps. Appendix 4E provides an example of the cause map of a first-year business student who participated in the pre-test, and one of the respondents in the Markstrat simulation.

While observing the managers completing the task, the researcher could see that they were putting a great deal of thought into the task. In the debriefing session, they indicated that they had found the task challenging and meaningful.

The task guidelines used in the cause mapping exercise were modified several times, given the results of successive pre-tests, to ensure clarity of understanding. The results of the last iteration indicated that respondents clearly understood the requirements of the task.

Phase 3 - Markstrat Study

Step 1 - Questionnaire 1: Cause Maps and Ranking

The elicitation of the cause maps and the ranking of the 18 factors occurred prior to the simulation, during class time, to enhance the credibility of the exercise as perceived by the students and to provide a controlled situation for the elicitation of the schema to ensure that it was an individual rather than a group response. This method also enabled the researcher to develop a rapport with the students and to offer personal encouragement for their involvement in the study. The procedure took approximately 45 minutes.

Step 2 - Video-Tape of Group Discussions

Five groups volunteered to have their meetings video-taped during the course of the simulation. They were provided with a conference room for their exclusive use during the study. In terms of the five possible initial start positions within an industry, one of the groups started in position two, two in position three, one in position four, and one in position five. There were no groups in the first start position. Two of the five groups were from the same industry. Over 100 hours of video-tape were collected and reviewed to provide insights into the group process.

Step 3 - Questionnaire 2

In the second last decision period, respondents were asked to complete the questionnaire shown in Appendix 4B. The questionnaires were distributed to each group by the administrator of the simulation at the time the group picked up their results for the period. The package for the group contained a questionnaire for each individual presented in an envelope with the individual's name written on it. Each envelope also contained a letter thanking the individual for responding to the first questionnaire, ensuring them confidentiality in responses to the second questionnaire, and providing instructions for the submission of the questionnaire. The individuals' names were written on their envelopes for two reasons. The first was to support the view conveyed to the respondents by the researcher at the outset of the simulation that their individual responses were very important. The receipt of a personally labelled envelope would encourage each individual to take more ownership in the task, thereby giving it careful attention. The second reason was to provide a secondary mechanism to ensure that the researcher could identify which respondent had completed the questionnaire. Although each questionnaire had a space in which the respondent was to fill in his or her name, it was felt that some respondents might forget to complete this area. Since each respondent was asked to seal and return the questionnaire in the original envelope to ensure that only the researcher would see the response, this method provided a means of making sure that a name could be attached to each questionnaire.

The questionnaire contained the measures of influence and involvement, the scale measuring the process of integrating, and two of the integration measures: 1) the degree to which members shared views; and 2) the level of support and understanding group members had for the decisions made by the group. Several additional questions were inserted as requested by the Marketing faculty to obtain information about the Markstrat simulation.

Step 4 - Questionnaire 3: Final Cause Map and Ranking

The third questionnaire, shown in Appendix 4C, was administered in the same manner as the second questionnaire. However, it was administered in the final decision period. The third questionnaire contained the same task as the first questionnaire, which involved drawing a cause map and ranking the 18 factors.

Step 5 - Video-tape of Presentations

In addition to the five groups video-taped during the course of the simulation, 40 of the 70 groups were video-taped as they presented a summary of their strategy and what they had learned at the end of the simulation.

SUMMARY

In summary, this chapter has presented the research issues, design, and methodology of the empirical portion of this dissertation. From the sociocognitive model discussed in Chapter II, the two primary dimensions of level of interpretation and level of integration were identified as the focus of the testable model. The research design utilizing the Markstrat simulation was selected to facilitate control while enhancing generalizability. Cause maps and traditional questionnaire items were used to measure the constructs of interest. Chapter V presents the analysis and results of the study. The discussion of the findings is reserved for Chapter VI.

TABLE 4.1

A COMPARISON OF MARKSTRAT FACTORS AND BOURGEOIS' FACTORS

BOURGEOIS (1980)	GATIGNON (1987)
Financial liquidity	Advertising
New sources of funds	Consumer Awareness
Advertising frequency	Competitive Actions
Advertising quality	Product Characteristics
Cost reduction	Price
Employee efficiency	Purchase Intentions
Employee morale	Sales force
Low price	Distribution
High price	Product availability
Brand image	Production volume
Company image	Market Share
Product quality	Segment volume
Product warranty	Sales
Customer credit	*Costs
Customer service	*Research and Development
Wide product range	*Funds availability
Specialized product range	*Inventory management
New product development	*Product repositioning
Existing product improvement	
Ownership/control over source of supply	
Ownership/control over distribution	
Prediction of customer requirements/tastes	
Prediction of competitor reactions	

* Factors added by this researcher after reviewing Markstrat Instructor's Guide

TABLE 4.2 COGNITIVE SCHEMA MEASUREMENT APPROACHES

Empirical Approaches to the Study of Knowledge Structures in Organizations

Subject Awareness of Behavior Assessment

Aware	Unaware
Self-reports Repertory Grid • Frame of Reference (Dunn & Ginsberg, 1986) • Organizational Frame of Reference (Dutton et al, 1988) • Means-ends (Jully et al, 1988) • Integrative Complexity (Slabell, 1978) • Cognitive Infrastructure of Organizations (Wacker, 1981) • Organizational Prototypes (Walton, 1966) Means-ends Analyses • Cause Map (Bougon et al, 1977) • Causes and Effects (Ford & Hegarty, 1984) • Cognition (Walker, 1985) Pairwise Comparisons • Perceptual Structures (Billings & Cornelius, 1980) • Cognition (Blackburn & Cummings, 1982) Object Sorting • Schemata (Lurigio & Carroll, 1985) • Implicit Theories (Sternberg, 1985) • Belief Structures (Walsh, 1988a) • Negotiated Belief Structures (Walsh et al, 1988) Self-Q Technique • Cause Map (Bougon, 1983)	Traces
Interactive Reports Strategic Assumption Surfacing Technique • Assumptions (Mason & Mitroff, 1982) Semi-structured Interviews • Schemata (Lurigio & Carroll, 1985) • Frames of Reference (Shrivastava & Mitroff, 1983) Questionnaires • Consensus (Dess, 1987) • Tacit Knowledge (Wagner, 1987)	Hidden Observers
Researcher Inference Policy Capturing Procedure • Managers' Perceptions (Ireland et al, 1987)	Key Informents
Public Behavior Analysis of Written Statements • Organizational Boundary Perceptions (Fiol, 1988) Analyses of Verbal Statements • Beliefs (Stubbart & Ramaprasad, 1987)	Archives Archival Data Analysis • Cognitive Maps (Axelrod, 1976) • Cognitive Maps (Levi & Tetlock, 1980)

WALSH 1989

TABLE 4.3 SUMMARY STATISTICS

VARIABLE	MEAN	STANDARD DEVIATION	MIN.	MAX.	N
SCHEMA COMPLEXITY					
# Constructs	16.11	1.29	11.50	18.00	70
# Relationships	23.21	4.88	13.60	43.33	70
# Constructs (ending)	16.49	1.42	11.29	18.00	65
# Relationships (ending)	23.26	4.15	13.00	34.00	65
VIEW DIVERGENCE					
View Divergence Rank	96.41	9.05	74.00	120.48	70
View Divergence Cause Map (Structure)	31.59	5.29	19.80	47.53	70
View Divergence Cause Map (Significance)	123.98	21.40	76.33	183.40	70
Shared Views Beginning	3.59	.31	3.04	4.44	70
INTEGRATION					
Shared Views End	3.73	.29	3.10	4.44	70
Support/Understanding	5.60	.67	3.10	6.63	70
Discuss	5.05	.99	2.28	6.58	70
View Divergence Rank (ending)	93.54	9.70	62.00	116.67	65
View Divergence Cause Map Structure (ending)	30.33	5.84	20.75	48.00	65
View Divergence Cause Map Significance (ending)	124.31	22.38	78.00	191.00	70
PERFORMANCE					
Cumulative Net Marketing Contribution	455.71	328.53	24.8	1235.8	70

CHAPTER V - THE FINDINGS:

ANALYSIS AND RESULTS

This chapter presents the analysis and results of the tests of the hypotheses conducted using the Markstrat simulation. As well, an analysis of the various construct measures is presented. Readers who are solely interested in the implications of the analysis and results may want to proceed directly to Chapter VI which is designed to stand alone as a summary and discussion of the findings.

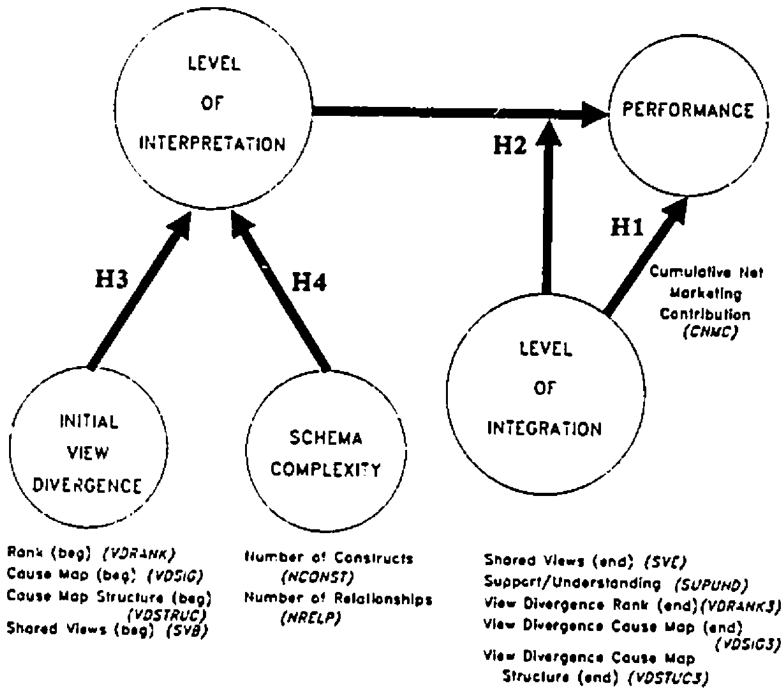
The primary purpose of the empirical portion of this dissertation was to test the hypotheses outlined in Chapter IV. However, since empirical research in the area of cognitive schemas is at an early stage of development, a secondary, but no less important purpose, was to further develop the methodology for measuring cognitive schemas. Since there are no well accepted measures for several of the constructs, multiple methods and measures were used wherever practical. Therefore, a key aspect of the analysis is to examine the dimensionality of the measures. In cases where the measures are not uni-dimensional, the similarities and differences of the measures are assessed, and their predictive validity is analyzed to determine which provides the best measure of the particular construct.

Since the results of the tests of the hypotheses must be interpreted in light of the reliability and validity of the measures, this chapter begins with an analysis of the construct measures and their dimensionality. Furthermore, for the purpose of clarity this chapter reports on the results of the key measures selected. The results for the remaining measures are presented in Appendices 5A and 5B. Therefore, before presenting the hypotheses, the measures are analyzed and the rationale for selecting the key measures is presented.

CONSTRUCT MEASURES AND THEIR DIMENSIONALITY

This section examines the dimensionality of the various measures derived from the variety of traditional and non-traditional measurement instruments used in the study. The research model originally presented in Chapter IV is reproduced in Figure 5.1 along with the abbreviations used for each of the measures of the various constructs and their sub-dimensions. The primary constructs are interpretation, integration and performance. Level of interpretation is derived from the sub-constructs of view divergence and schema complexity. This section presents an analysis of the dimensionality of the measures shown in Figure 5.1, by examining the correlation between measures followed by a presentation of a factor analysis of the measures. In addition, the predictive validity of each of the measures is assessed to determine which measure is the best predictor of performance. It is expected that the analysis presented in this section will further the development of the methodology for measuring cognitive schemas and will provide insight into the strength of the results achieved in testing the hypotheses. Each of the constructs, their sub-dimensions, and the associated measures is addressed in turn, beginning with the sub-dimension of interpretation, view divergence.

FIGURE 5.1 - RESEARCH MODEL AND ASSOCIATED MEASURES



View Divergence

View divergence is one of the two sub-dimensions of interpretation. Since interpretation refers to a group's potential at the start of a process, the sub-construct of view divergence must also be understood as referring to initial view divergence. However, divergence is also used at the end of the simulation as one of the measures of integration. Although the same instruments were used to measure initial and ending view divergence, it was expected that a factor analysis would identify initial and ending measures as distinct factors. As discussed in Chapter IV, and shown in

Figure 5.1, the four measures of initial view divergence among members of a group were as follows:

1) Divergence on the initial ranking of the importance of the 18 factors (vdrank);
2) Divergence between the structure of the initial cause maps according to whether or not respondents agreed that a relationship existed between two factors (vdstruc);
3) Divergence between the initial cause maps, including divergence on the strength of the relationship between the factors as well as the structure (vdsig); and
4) A self-report measure taken at the end of the simulation asking each respondent to indicate the degree to which he or she initially shared views with each of the other members in the group (svb).

The first measure was derived from the ranking task in the first questionnaire, while the second and third measures were both derived from the cause maps elicited in the first questionnaire. For all three measures, divergence was calculated by taking the difference of the absolute deviations between the rank order of factors, or between elements of the cause map for each pair of individuals in the group. The group score was calculated as the mean of the paired scores. The fourth measure was derived from the second questionnaire, administered near the end of the simulation, and was calculated as the mean score for the individuals in the group.

The instruments used for the four measures of ending view divergence were virtually identical to the instruments for the initial measures. Measures of divergence on the ending rank order of importance of the 18 factors and divergence on the ending cause maps were obtained by administering the same questionnaire at the end of the simulation. As well, a self-report measure was taken at the end of the simulation asking each respondent to indicate the degree to which he or she shared views with each of the other members of the group at the end of the simulation (sve). The four final measures, labelled vdrank3, vdsig3, vdstuc3, and sve, respectively were calculated for each group using the method described above for the initial measures.

There is no established method for obtaining a measure of reliability on cause maps. Since cause maps are expected to change over time to reflect learning that has occurred, test re-test measures of reliability are problematic. As well, traditional measures, such as Cronbach's alpha, which was used for the scales in this study, do not apply since the items or factors in the cause map are interdependent rather than dependent measures of the construct. Therefore, to obtain an estimate of reliability, a split half measure of reliability was taken. For the split half measure of reliability on the cause map, view divergence amongst members of the group on the top half of the matrix capturing the cause map was correlated with view divergence on the bottom half of the matrix. The split half correlation between the top and the bottom half was .76. However, the split half reliability between the top and the bottom may be a high estimate, since splitting the matrix in two means that the relationship between the top nine factors across all 18 factors is correlated with the bottom nine factors by all 18 factors. Therefore, the halves are not independent. A more conservative estimate which calculates the correlation between the top left quadrant and bottom right quadrant indicated a lower estimate of reliability at .41. The correlation was adjusted using the Spearman Brown formula to correct for length[2] to reflect the expected reliability of the actual instrument which was double the length of any one half. Therefore, corrected for length, the split half reliability for the two independent portions of the cause map was .58.

The foregoing measurement of reliability on the cause map was calculated for the measurement of view divergence on the strength of the relationships in the cause map. As will be discussed in more detail below, the second measure of divergence on the cause map examined differences in structure alone; that is, whether individuals agreed that a relationship existed between two factors regardless of the strength of the relationship. The same approach for calculating reliabilty was used for view divergence on structure with very similar results. The split half correlation for the independent quartiles was .42. Corrected for length the correlation was .59.

For the ranking instrument, the split half correlation between the top and the bottom was .239. Five additional random splits of the rank items yielded correlations of

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[2] Spearman Brown formula to correct for length

$$rnn = \frac{nrtt}{1 + (n-1)\,rtt}$$

.280, .195, .258, .321, and .389. The average of the six splits was .280. When adjusted using the Spearman Brown formula to correct for length, the revised reliability estimate was calculated to be .44.

The same calculations of reliability were used for the final measures of view divergence. Corrected for length, the split half correlation for the significance cause map was .60, for the structural cause map .68, and for rank .47.

Calculating reliability for the self-report measures of the degree to which individuals shared views with other members in the group is also complicated. Since the average of the individual scores was used to obtain a group score, each individual was treated as a separate measure of view divergence. Therefore, a Cronbach's alpha was calculated for both the beginning and ending measure of shared views to determine whether individuals in the group held the same views. The Cronbach's alpha for the beginning measure was .50 and for the ending measure .60.

The reliability estimate for each of the measures is displayed on the diagonal of the correlation matrix presented in Table 5.1. The reader is cautioned that just as the calculations of the reliability estimates are non-traditional, so too is the interpretation. For example, the initial split half correlation between the top and bottom halves of the matrix was quite high at .76. A more conservative estimate of reliability between the quartiles was .58. There is a considerable gap between the two estimates, with the true estimate likely falling somewhere in between the two estimates. However, what may be concluded from the reliability estimates is that the instruments have at least a moderate level of reliability.

In summary, there were eight measures of view divergence: four measured initial view divergence, one of the sub-dimensions of interpretation; and four measured view divergence at the end of the simulation, which were measures of integration. Three different instruments were used to measure view divergence. The same instruments were used at the beginning and at the end of the simulation. It was expected that a factor analysis would identify the beginning and ending measures as distinct.

The correlation coefficients for the eight initial and ending measures of view divergence is shown in Table 5.1. Rather than addressing each separately, the correlations have been grouped for ease of analysis under four headings. The following sections will report on the correlations between 1) divergence on the structure of the cause maps, and the divergence on the significance of the cause maps; 2) divergence on rank, and divergence on the cause maps; 3) divergence on the beginning measures, and divergence on the ending measures; and 4) divergence on the self report measures, and divergence on rank and the cause maps.

TABLE 5.1 CORRELATION MATRIX: VIEW DIVERGENCE

	VD RANK	VD SIG	VD STRUC	VD RANK3	VD SIG3	VD STUC3	SVB	SVE
View Divergence on Rank	.44	.202*	.243*	-.068	-.095	-.016	-.292	-.316
View Divergence on Cause Map - Significance		.58	.962**	-.123	.328**	.331**	-.241	-.295**
View Divergence on Cause Map - Structure			.59	-.135	.315**	.357**	-.271**	-.334**
View Divergence on Rank (ending)				.47	-.128	-.131	-.087	-.095
View Divergence on Cause Map - Significance (ending)					.60	.949**	.058	.017
View Divergence on Cause Map - Structure (ending)						.68	-.049	-.115
Shared Views Beginning							.50	.792**
Shared Views End								.60

* .05

**.01

Structural and Significance Cause Maps

From the same cause map, two different measures of view divergence were taken. Divergence on the structure of the cause maps captures whether individuals agree that a relationship exists between two factors. View divergence on the significance of the cause map captures difference regarding the strength of the relationship between factors. For example, one individual may indicate that there is a relationship between Research and Development, and Costs with a strength of 5, indicating a very strong relationship. Another individual in the group may agree that a relationship exists, but code it with a 4 rather than a 5, indicating a strong relationship. A third individual may not have indicated any relationship between Research and Development, and Costs. When divergence on significance of the cause maps is examined, the first two individuals have an absolute difference of 1, the first and third individual have an absolute difference of 5, and the second and third have an absolute difference of 4. When structure alone is examined, the strength of the relationship is ignored. Therefore, if a relationship is indicated, it receives a code of 1, regardless of the strength of the relationship. Divergence on structure alone for the first two individuals would be 0, for the first and third, 1 and for the second and third 1. It was anticipated that individuals might agree on the structure of a cause map but disagree on the strength of the relationships between the variables. By separating the structural dimension from the significance dimension, differences between the measures could be assessed.

The correlations between divergence on structure and divergence on significance are extremely high at .96 for the beginning measures (vdstruc, vdsig) and .95 for the ending measures (vdstuc3, vdsig3) indicating that there is *very little difference between divergence on the total cause map, which includes the strength of the relationship, and divergence on the structure of the cause map alone.* However, the two measures are not entirely independent, since the measure of view divergence on the significance of the cause map also captures differences on structure. To reduce the interdependence between measures, view divergence on significance was calculated for only those relationships where individuals agreed there was a relationship. The correlation between the revised measure of view divergence on significance and view divergence on structure was lower at .57, but still quite high, indicating the strong relationship between structure and significance.

Cause Map and Rank

Although there are significant correlations between each of the measures of initial divergence on the cause map (vdsig, vdstruc) and initial divergence on rank (vdrank), the correlations are only moderate at .20 and .24. There are no significant correlations between the same group of ending measures.

The moderate correlations between the two initial cause map measures and the initial rank measure indicate that the measure of *divergence based on the rank order of importance of the variables may capture a different diversity than the measure of* *divergence based on the nature of the relationships between the variables.* In other words, they appear to measure two distinct facets or types of view divergence. Correcting the correlations for attenuation[3] based on the reliability of the cause map and the ranking instruments yields revised estimates of common variance between view divergence on significance of the cause map and rank of .40, and between view divergence on the structure of the cause map and rank of .48. *The corrected correlations indicate that there may be a stronger relationship between the two measures than exhibited by the uncorrected correlations, suggesting that the measures may be unidimensional.*

Beginning and Ending Measures

An analysis of the relationship between beginning and ending measures indicates that there is *no significant correlation between the measure of initial view divergence based on rank (vdrank) and any of the measures of ending view divergence on rank or the cause map (vdrank3, vdsig3, vdstuc3).* Similarly, there is *no significant correlation between the measure of ending view divergence based on rank (vdrank3) and any of the measures of initial view divergence (vdrank, vdsig, vdstruc).* The only significant correlations were between the measures of initial view divergence based on structure and significance of the cause maps (vdstruc, vdsig) and the corresponding measures of ending view divergence (vdstuc3, vdsig3). The moderate correlations in

[3] Formula to correct correlations for attenuation

$$\widehat{rab} = \frac{rab}{\sqrt{raa}\,\sqrt{rbb}}$$

the .30 range indicate that *while the level of view divergence measured on the cause maps changes from the beginning to the end of the simulation, the two measures have a moderate association.*

Self-Report Measures of Divergence

The self-report measures about shared views at the beginning and at the end of the simulation (svb, sve) show significant moderate negative correlations with the measures of initial view divergence based on rank (vdrank), structure of the cause maps (vdstruc) and significance of the cause maps (vdsig), indicating that *the more the individual reported a sharing of views, the less the view divergence on the three measures.* There was *no significant correlation between the measures of shared views (svb, sve) and the ending measures of view divergence (vdrank3, vdstuc3, vdsig3).* The self-report measures of shared views at the beginning (svb) and end (sve) of the simulation, taken at the end of the simulation, showed a significant high correlation at .79, indicating only *moderate changes in the sharing of views as reported by the individuals in the group.*

A principal components factor analysis was conducted on the beginning and ending measures of view divergence on rank and the cause map (vdrank, vdsig, vdstuc, vdrank3, vdsig3, vdstuc3) to gather evidence on the dimensionality of the measures. As expected, the factor analysis with varimax rotation indicated two distinct factors, using an eigenvalue of 1 as the cut-off. The initial statistics and rotated factor matrix are shown in Table 5.2

TABLE 5.2 FACTOR ANALYSIS - VIEW DIVERGENCE

VARIABLE	COMM.	FACTOR	EIGEN.	% VAR.	CUM %
VDRANK	1.0	1	2.858	47.6	47.6
VDSTRUC	1.0	2	2.036	33.9	81.6
VDSIG	1.0	3	.735	12.3	93.8
VDRANK3	1.0	4	.313	5.2	99.0
VDSTUC3	1.0	5	.044	.7	99.8
VDSIG3	1.0	6	.014	.2	100.0

VARIABLE	FACTOR 1	FACTOR 2
VDSIG3	.969	.087
VDSTUC3	.968	.090
VDRANK3	.877	.002
VDSTRUC	.106	.952
VDSIG	.087	.948
VDRANK	-.011	.640

The two factors had eigenvalues greater than 2, accounting for 81.6% of the variance. The results of the varimax rotation showed that the first factor consisting of the ending measures had factor loadings ranging from .877 to .969. The second factor consisting of the beginning measures of view divergence had factor loadings ranging from .640 to .952. The beginning and ending measures loaded cleanly on the two factors, given that each measure had high loadings on only one factor.

An oblique rotation as opposed to the orthogonal varimax rotation was also conducted. The oblique solution converged on the same solution as the orthogonal rotation. As well, a principal factors analysis using the reliability estimates for the measures on the diagonal was conducted. The results indicated a two factor solution with similar loadings to the principal components analysis.

The above analysis consistently indicated a two factor solution with the beginning and ending measures loading cleanly on each of the two factors, using an eigenvalue of 1 as a cut-off. However, a scree plot indicated the possibilility of a three or four factor solution. When four factors were specified in the analysis, the beginning and ending measures of view divergence on the cause map were distinguished from the beginning and ending measures of view divergence on rank. However, while beginning and ending view divergence on the cause map loaded cleanly on separate factors, beginning view divergence on rank had a loading of .97 on its own factor and a loading of .25 on the beginning cause map factor. As well, ending view divergence on rank had a loading of .78 on its own factor and a loading of .60 on the ending cause map factor.

Further investigation of the dimensionality of the three beginning measures (vdrank, vdsig, vdstruc), using a principal components factor analysis, showed one factor with an eigenvalue of 2.2 accounting for 74% of the variance.

As well, a reliability analysis of the three beginning measures yielded a Cronbach's alpha of .65 with a standardized item alpha of .81. The analysis indicated the alpha would drop if any of the measures were excluded from the analysis.

In summary, there are conflicting results on the dimensionality of the three initial measures of view divergence. Evidence suggesting that the measures of divergence on cause map and rank are distinct is provided by the low uncorrected correlations between the cause map measures and rank, as well as by the scree plot from the factor analysis. However, evidence suggesting the measures are uni-dimensional is provided by the correlations corrected for attenuation, indicating a stronger relationship between the measures than was suggested by the uncorrected correlations. As well, the two factor solution from the factor analysis indicated that the beginning measures were uni-dimensional, as did the reliability analysis. Given the equivocality, of the results **four different measures of view divergence are proposed:** 1) the self-report measure of the degree to which group members shared views at the beginning of the simulation (svb); 2) view divergence on the ranking of the factors (vdrank); 3) view divergence on the cause map (vdcause) comprised of both the divergence on significance (vdsig) and the divergence on structure (vdstuc); and 4) view divergence on both the ranking of factors and the cause map (vdbeg) comprised of vdrank and vdcause.

Schema Complexity

The second dimension of interpretation is schema complexity. There are two measures of initial schema complexity: 1) the number of factors or constructs the respondent used in the cause map indicating the degree of differentiation (nconst); and 2) the number of relationships among the factors, indicating the degree of integration (nrelp). Corresponding measures of schema complexity were also taken at the end of the simulation by examining the final cause maps (nconst3, nrelp3).

Similar to the analysis of reliability conducted for view divergence on the cause maps, the number of relationships among factors found in the upper left quadrant of the matrix representing an individual's cause map was correlated with the number found in the bottom right hand quadrant. The same analysis was conducted for the number of constructs. The split half correlation for the number of relationships was .61 and for number of constructs .47. Adjusted for length, the revised estimates were .76 and .64 respectively. For the ending measures of schema complexity the split half correlation for the number of relationships was .53 and for number of constructs .56. Adjusted for length, the revised estimates were .69 and .72 respectively.

The correlation matrix for schema complexity is shown in Table 5.3. The reliability estimates, adjusted for length, are shown on the diagonal of the matrix. *The number of constructs in the cause map, both at the beginning and at the end, has a highly significant correlation with the number of relationships between cause maps.* The correlation between the beginning measures was .65 and between the ending measures was .77. However, a high correlation is expected, since the measures are not independent; that is, for every construct added to the cause map, there is a minimum of at least one additional relationship. Therefore, the minimum expected number of relationships is equal to the number of constructs minus 1. When the minimum number of relationships is subtracted from the total number of relationships, the correlation between the number of constructs and number of relationships drops to .44.

There is also a significant, high correlation between the beginning measures and the ending measures at .486 for the number of constructs and .341 for the number of relationships, indicating that *while there are certainly changes in schema complexity, there is also a high degree of association between the complexity of the two cause maps.*

TABLE 5.3 CORRELATION MATRIX: SCHEMA COMPLEXITY

	NCONST	NRELP	NCONST3	NRELP3
Number of Constructs	.64	.646** $_{(.000)}$	.486** $_{(.000)}$	.414** $_{(.000)}$
Number of Relationships		.76	.235* $_{(.030)}$	.341** $_{(.003)}$
Number of Constructs (ending)			.72	.765** $_{(.000)}$
Number of Relationships (ending)				.69

*.05
**.01

As expected, the orthogonal factor analysis of the four schema complexity constructs yielded a two factor solution, divided into beginning and ending measures, accounting for 89.5% of the variance as shown in Table 5.4.

TABLE 5.4 FACTOR ANALYSIS - SCHEMA COMPLEXITY

VARIABLE	COMM.	FACTOR	EIGEN.	% VAR.	CUM. %
NCONST	1.0	1	2.344	58.4	58.4
NCONST3	1.0	2	1.241	31.0	89.5
NRELP	1.0	3	.328	8.2	97.7
NRELP3	1.0	4	.094	2.3	100.0

VARIABLES	FACTOR 1	FACTOR 2
NCONST3	.968	.109
NRELP3	.954	.190
NRELP	.133	.910
NCONST	.146	.904

The first factor, consisting of the beginning measures, had factor loadings of .954 and .968; the second factor, consisting of ending measures, had factor loadings of .904 and .910.

The results of the correlation and factor analysis indicate that the beginning and ending measures can be viewed as distinct constructs and that the two measures of initial schema complexity are uni-dimensional. Therefore, one measure of schema

complexity (comp) combining the number of constructs (nconst) and the number of relationships between them (nrelp) is proposed.

Integration

There are several measures that were intended to capture the level of integration at the end of the simulation:

1) a self report measure, taken at the end of the simulation, asking individuals to identify on a five point scale the degree to which they shared views with other group members (sve);
2) a four item, seven point scale asking individuals whether they supported/opposed, agreed and understood the decisions made by their group (supund); and
3) the three measures of final view divergence discussed in the section on view divergence (vdrank3, vdsig3, vdstruc3).

A separate measure captured the process of integrating using a seven item, seven point scale (discuss). Questions related to whether the group members: thought group discussions were productive; listened to each others ideas; felt they made the most of each member's skills and abilities; integrated everyone's perspective; cooperated; synthesized viewpoints; and thought groups discussions were dominated by a few individuals.

The scale measuring support and understanding (supund), and the discuss scale are both uni-dimensional scales with high reliability. The four item support/ understanding scale (supund) has a Cronbach's alpha of .75, and the seven item discuss scale has an alpha of .86. When the question regarding whether individuals dominated group discussions was dropped from the discuss scale, the alpha increased to .88.

Since the relationships among the three final measures of view divergence have already been discussed in the view divergence section, this discussion will focus on their relationship with the other measures of integration. The correlation between measures is shown in Table 5.5. The reliability of the measures is shown on the diagonal of the correlation matrix. Essentially there was *no significant correlation among the final measures of view divergence (vdrank3, vdsig3, vdstuc3) and the self report measure (sve) or the two integration scales (supund, discuss). The highest correlations at -.178 indicated that the greater the divergence on the structure of the final cause map, the lower the level of support/understanding (supund) and discussion (discuss), as was expected.*

There are *high significant correlations between the self report measure (sve) and the integration scale (supund) at .527, and between the self report measure (sve) and the integration scale (discuss) at .511. The high correlation between the process measure of integration (discuss), and the content measure (supund) at .734 indicates that the* *process of reaching integration has a high association with whether or not individuals support and understand the decisions made during that process.*

Further analysis of the relationship between the process measure of integrating (discuss) and the content measure of integration (supund) indicated that only 8 of the 70 groups had a high score on the content measure and low score on the process measure. As well, only 8 groups had a high score on the process measure and a low score on the content measure. The remaining 54 groups were almost evenly split between having consistently low scores on both measures, and consistently high scores on both measures.

TABLE 5.5 CORRELATION MATRIX: INTEGRATION

	SVE	SUPUND	DISCUSS	VDRANK3	VDSIG3	VDSTUC3
Shared Views End	.50	.527*** (.000)	.511*** (.000)	-.095 (.225)	.017 (.447)	-.115 (.180)
Support/ Understanding		.75	.734** (.000)	.065 (.304)	-.092 (.233)	-.170* (.08)
Discussion			.88	-.118 (.174)	-.111 (.188)	-.178* (.078)
View Divergence on Rank (ending)				.47	-.128 (.156)	-.131 (.150)
View Divergence on Cause Map - Significance (ending)					.60	.949*** (.000)
View Divergence on Cause Map - Structure (ending)						.68

*.10
**.05
***.01

Since the ending view divergence measures were not correlated with the other measures of integration, they were viewed as a separate measure and combined to form the new variable called vdend. The self-report measure (sve) was also maintained as a separate measure of integration. Therefore **four measures of integration are proposed**: 1) the support/understanding scale supund; 2) the scale measuring the integration process discuss; 3) the three measures of view divergence on rank and the cause map at the end of the simulation vdend; and 4) the self-report measure at the end of the simulation sve.

The foregoing sections discussed the various measures and their dimensionality. An additional measurement issue to be addressed is the weighting of interpretation by level of influence and involvement of group members, as discussed below.

Influence and Involvement

Measures of influence and involvement were based upon the self-report measures of individuals in the group regarding their own level of influence and involvement and that of the other individuals in the group. Three measures to weight interpretation were obtained:

1. A group member's level of influence on the group;
2. A group member's level of influence on the respondent; and
3. A group member's level of involvement in the group.

While inter-rater reliability is not a necessary condition in the study, it is interesting to note the level of agreement amongst group members regarding the level of influence and involvement of their team members. As shown in Table 5.6, using Kendall's Coefficient of Concordance, the average Kendall's W for level of involvement is .52 where 40 of the 70 groups were found to have a significant level of inter-rater reliability at the .05 level. For level of influence, the Kendall's W was slightly higher at .53 with 45 of the 70 groups significant at the .05 level.

As was expected, the T-tests in Table 5.6 show that *level of influence was significantly different than level of involvement* with a T statistic of 12.34, significant at .000. Group member *involvement was generally higher than influence.* As well, it was found that individuals reported that *group members were more likely to have influenced others than to have influenced them personally.* The T statistic of 2.92 was significant at the .05 level.

TABLE 5.6 INFLUENCE AND INVOLVEMENT

	Kendall's W	Significance of W
Involvement	.52	40 to Groups Significant at .05
Influence	.53	45 to Groups Significant at .05

T Tests

	T Value	Significance of T
Involvement > Influence	12.34	.000
Influence Group > Influence Me	2.92	.019
Shared Views End > Shared Views Beginning	3.89	.001

Choice of Measures

The foregoing sections discussed the construct measures and their dimensionality. The following chart outlines the constructs and the associated measures that were proposed based on the analysis of the dimensionality of the constructs.

INTERPRETATION

- Interpretation (interp: comprised of vdbeg & comp)

Schema Complexity

- Schema Complexity (comp)

View Divergence

- View Divergence on Rank & Cause Map at beginning (vdbeg: comprised of vdrank, vdstruc, vdsig)
- View Divergence on Rank (vdrank)
- View Divergence on Cause Map (cause: comprised of vdstruc & vdsig)
- Shared Views Beginning (svb)

INTEGRATION

- Support/Understanding (supund)
- Discussion (discuss)
- Shared Views End (sve)
- View Divergence on Rank and Cause Map (vdend: comprised of vdrank3, vdsig3, vdstruc3)

PERFORMANCE

- Cumulative Net Marketing Contribution (cnmc)

Independent analysis was carried out on each different combination of constructs and measures. There are four measures of view divergence (vdbeg, vdrank, cause, svb); one measure of schema complexity (comp); one measure of interpretation (interp: combines vdbeg and comp) - all of which could be weighted by levels of involvement and influence (by both the group and the respondent). There are also four measures of integration (supund, discuss, sve, vdend), and different levels of performance associated with different start positions. A summary of the analysis is outlined in Appendix 5B.

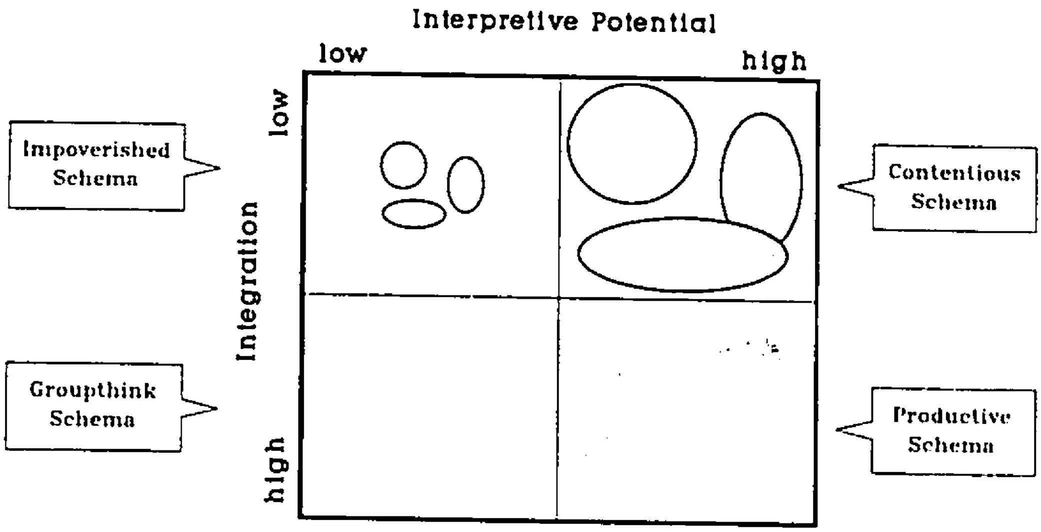
Given the analysis of the dimensionality of the constructs, and the results of the analysis of variance of the various measures with performance, one key measure was selected for each construct. Therefore, for the test of the hypotheses that follow, view divergence on both rank and the cause map (vdbeg) was used as the measure of view divergence. It was selected over the other three measures of view divergence for several reasons. Combining view divergence on rank and view divergence on the cause map was consistent with the results of the factor analysis and the reliability analysis which indicated that the measures were uni-dimensional. Conceptually, while both measures capture diversity, the ranking captures diversity on the importance of the elements, while the cause map captures diversity on the relationships among the elements. The strength of the combined measure of diversity on rank and the cause map is evidenced in its capacity as a predictor of performance. Of all of the measures of view divergence, it had the strongest relationship with performance.

Since there was only one measure of schema complexity (comp), there was no decision required. Interpretation was an average of the measure of view divergence (vdbeg) and the measure of schema complexity (comp). The measure of integration was the scale measuring support and understanding (supund). The support and understanding scale was selected over the other measures of integration for several reasons. Conceptually, it was the strongest measure of integration, since it captured the degree of support and understanding group members had for the decisions made by the group. As such, it captured whether or not integration had occurred, as opposed to how it occurred, as was intended by the process measure called discuss. As well, the support/understanding measure was the strongest predictor of performance. Since the weighting of the measures of influence and involvement did not alter the results significantly, unweighted measures were used. A more in depth discussion of all of the measures is provided in Appendix 5B. As well, the chi-square analysis of the frequency of groups for each schema type, for the various measures of interpretation and integration, is presented in Appendix 5C.

TEST OF HYPOTHESES

The hypotheses were generated from the research model discussed in Chapter IV and illustrated in Figure 4.1. Since the primary hypotheses relate to differences in schema types based on the dimensions of interpretation and integration, the types of organization schema, as discussed in Chapter III, and illustrated in Figure 3.1, are reproduced in Figure 5.2 for the reader's ease of reference. In the following discussion, Figure 5.2 is referred to as the "basic model".

FIGURE 5.2 TYPES OF ORGANIZATION SCHEMA



The theoretical support for the hypotheses was developed in Chapters I through III, and encapsulated in Chapter IV when each of the five hypotheses were discussed. This chapter will not reiterate the underlying theory, but rather will focus on the hypothesized relationships and the tests used to assess whether there is evidence to support each of the five hypotheses.

H1: Groups with high integration will perform better than groups with low integration.

i.e. Performance of Productive + Groupthink Groups > Performance of Contentious + Impoverished Groups

Evidence to support or refute H1 was derived from several tests. At the broadest level, a simple test is to examine whether the mean performance of Productive and Groupthink groups was higher than Contentious and Impoverished groups. While a lower level of performance would indicate that the hypothesis was not supported, a higher level of performance is a necessary but not sufficient condition to support H1. An analysis of variance (ANOVA) was conducted to determine the significance of the mean differences in performance. The main effect for integration in the ANOVA indicates the strength and significance of the relationship between integration and performance. However, if there is the hypothesized interaction between interpretation and integration as discussed in H2, significant main effect results may be misleading. The main effect can be misleading, for example, if the interaction between interpretation and integration raises the performance of Productive groups to the point that, on average, the performance of groups with high integration (both Productive and Groupthink) is greater than groups with low integration (Contentious and Impoverished groups). However, Groupthink groups alone may not have higher performance than the low integration groups, indicating that it is not simply integration, but the interaction between integration and interpretation that is associated with higher performance. Therefore, in the event of a significant interaction effect between interpretation and integration as indicated in the ANOVA, a further test must be conducted to determine whether both Productive and Groupthink groups outperform Contentious and Impoverished groups. As a result, a test of the specific contrasts between the mean performance of each of the four groups was conducted to determine whether the differences were significant or occurred by chance.

H2: Groups with high interpretation will only perform better than groups with low interpretation if they have high integration.

i.e. Productive > Groupthink
Productive > Contentious
Productive > Impoverished

A corollary of hypotheses 1 and 2, that is included as part of hypothesis 2 was the expectation that Groupthink groups would perform better than both Contentious and Impoverished groups.

As was described in H1, the broadest assessment of H2 is to examine the mean performance of each of the four schema types to determine whether the expected pattern is exhibited. Secondly, a two-way ANOVA, with interpretation and integration as the independent variables, and performance as the dependent variable, assesses whether there is the expected interaction between interpretation and integration. The interaction is expected since a high level of interpretation refers to the **potential** that exists within the group. If the diverse and complex views are not integrated, it is expected that groups with high interpretation and low integration will have poor performance. However, a significant interaction effect does not indicate which schema types are significantly different and whether the differences are in the hypothesized direction. Therefore, it is necessary to examine the specific contrasts between the mean performance of each of the four schema types to assess whether H2 is supported.

H3: Groups with low integration and low view divergence will perform better than groups with low integration and high view divergence.

The foregoing hypotheses have not addressed the expected relationship between Impoverished and Contentious groups with respect to level of performance since, in the case of low integration, the two sub-dimensions of interpretation, view divergence and schema complexity, are expected to have opposite effects on performance. As discussed in Chapter IV, in the absence of integration, low view divergence is expected to facilitate taking coherent or internally consistent actions. For H3, a variation of the basic model must be examined as depicted in Figure 5.3 to assess the relationship between view divergence, integration, and performance. As for H1 and H2, the mean performance of the two groups can be examined to determine whether there is support for the hypothesis. However, the specific contrast between the two groups must be examined to determine whether the difference in performance is significant.

H4: Groups with low integration and high schema complexity will perform better than groups with low integration and low schema complexity.

For groups with low integration, H3 stated that groups with low view divergence would have higher performance. The opposite effect is expected in H4. Since schema complexity should be less affected by the need for integration, groups with high schema complexity are expected to have higher performance. Again, a variation of the basic model which examines the relationship between schema complexity, integration, and performance, as depicted in Figure 5.3, is necessary to test H4. As for H3, the mean performance of the two groups and the specific contrasts are examined to determine whether the hypothesis is supported.

H5: There will be more groups with Contentious schemas than groups with Productive schemas, and more groups with Groupthink schemas than groups with Impoverished schemas.

i.e. # Contentious Groups > # Productive Groups
Groupthink Groups > # Impoverished Groups

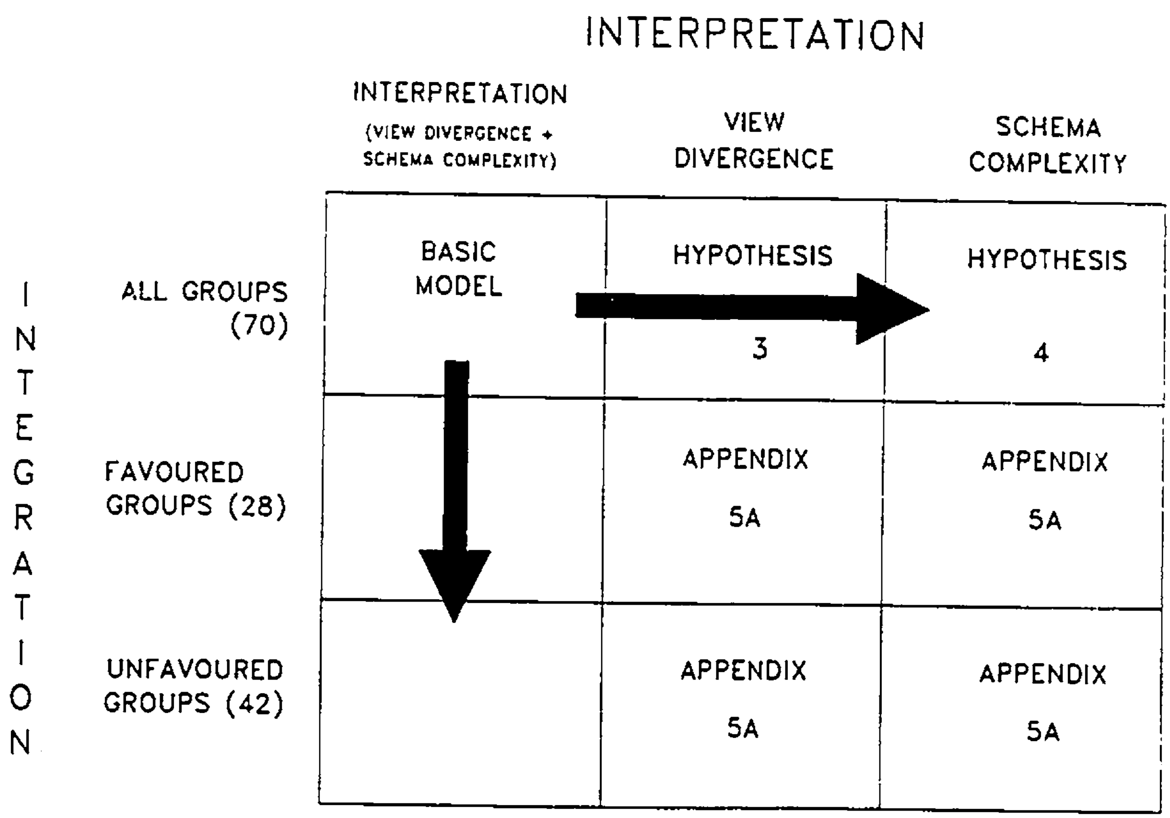
While hypotheses H1 to H4 refer to the expected differences in performance between the four schema types, H5 refers to the expected incidence or frequency of each schema type, given the difficulty of integrating complex and diverse schemas, and, conversely, the ease of integrating schemas with a low level of complexity and diversity. To assess whether the hypothesis is supported, a chi-square analysis of the difference in frequency of schema types is conducted.

If hypothesis 5 is supported, it suggests a more difficult or stringent test of the other hypotheses, since unequal cell frequencies means that the analysis of variance is not orthogonal. The less orthogonal the ANOVA, the more difficult it is to obtain significant results.

Hypotheses 1, 2, and 5 can be tested by examining the differences in schema types along the dimensions of level of interpretation and integration as depicted in Figure

5.2. However, the basic model must be magnified along two dimensions, as depicted in Figure 5.3., to test hypotheses 3 and 4, and to provide greater insight into the results. Since there are two sub-dimensions of interpretation, view divergence and schema complexity, they need to be examined separately to address hypotheses 3 and 4. Furthermore, as will be discussed below, it was found that two of the five groups in the 14 industries had significantly favourable start positions; therefore, the analysis needs to be expanded to consider the effects for both favoured and unfavoured groups as depicted in Figure 5.3.

FIGURE 5.3 TESTS OF HYPOTHESES



The basic model can be expanded by examining the two dimensions of interpretation, view divergence and schema complexity, and by examining differences for groups beginning in favourable and unfavourable start positions. As a result, there are eight different variations of the basic model which can be examined. In order to avoid unnecessary complication of the discussion, Appendix 5A, as indicated in Figure 5.3, presents the results for the four variations of the basic model arising from the examination of view divergence and schema complexity, for favoured and unfavoured groups.

The following section begins with a presentation of the analysis and results of the tests of the hypotheses, using the basic model. The analysis is presented in three parts. The first part presents the table of results regarding the mean performance and frequency of groups represented by each schema type. By examining the means and frequencies, the reader can assess the expected patterns of relationships among the schema types. From the means and frequency table, a chi-square analysis is conducted to test hypothesis 5 regarding the expected frequency of each schema type. A table of the results from a two-way ANOVA is then presented, to test whether or not hypothesis 1, regarding the relationship between integration and performance was supported. The results of the two-way ANOVA also indicate whether or not there is a two-way interaction between interpretation and integration, as expected from hypothesis 2. However, if the two-way ANOVA indicates an interaction effect, it is necessary to examine specific contrasts between the schema types to determine whether there is any significant difference in performance between the pairs of schema types, as indicated in hypotheses 1 and 2. Therefore, a table of contrasts is presented, indicating the T statistic and corresponding probability for each pair of contrasts. In summary, for the basic model three tables of results are presented. The first table of mean performance and frequencies addresses hypothesis 5, the second table reports the results of the two-way ANOVA in response to hypotheses 1 and 2, and the third table reports the contrasts in schema types in response to hypotheses 1 and 2.

The same three-part analysis is conducted for view divergence, in response to hypothesis 3; and for schema complexity, in response to hypothesis 4. As well, the three-part analysis is used to examine differences in the basic model between groups beginning in favourable and unfavourable start positions.

Basic Model: Interpretation and Integration

For the basic model, the mean cumulative net marketing contribution (cnmc) and frequencies of the 70 groups for the high and low levels of interpretation and integration are shown in Table 5.7. The high and low levels of interpretation and integration were determined using the median as a demarcation point, as was discussed in Chapter IV. Further to that discussion, cnmc was used as the measure of performance, since the groups were aware that the maximization of cnmc was the single criterion used to compare the performance of the various groups.

As can be seen in Table 5.7, groups with a Productive schema had the highest performance with a mean cnmc of $640.1 million, while Contentious groups had the lowest performance with a mean cnmc of $282.5 million.

TABLE 5.7 INTERPRETATION BY INTEGRATION: Cell Means and Frequencies

		INTERPRETATION: LOW	INTERPRETATION: HIGH	TOTAL
INTEGRATION	LOW	IMPOVERISHED SCHEMA $\bar{X}$ CNMC* = $376.3 (Groups = 13)	CONTENTIOUS SCHEMA $\bar{X}$ CNMC = $282.5 (Groups = 23)	$\bar{X}$ CNMC = $316.4 (Groups = 36)
INTEGRATION	HIGH	GROUPTHINK SCHEMA $\bar{X}$ CNMC = $583.2 (Groups = 22)	PRODUCTIVE SCHEMA $\bar{X}$ CNMC = $640.1 (Groups = 12)	$\bar{X}$ CNMC = $603.2 (Groups = 34)
	TOTAL	$\bar{X}$ CNMC = $506.3 (Groups = 35)	$\bar{X}$ CNMC = $405.1 (Groups = 35)	$\bar{\bar{X}}$ = $455.7 (Groups = 70)

* $\bar{X}$ CNMC = Mean cumulative net marketing contribution in millions of dollars

Hypothesis 5: Frequency of Schema Types

Hypothesis 5 stated that there would be different frequencies of groups for each schema type, since it was expected that it would be easier to integrate the low level of diversity arising from low interpretation than to integrate the high level of diversity in groups with a high level of interpretation. More specifically, it was expected that there would be more Groupthink groups than Impoverished groups, and more Contentious groups than Productive groups. If there had been no difference in frequency for each schema type, there would have been roughly 17 or 18 groups in each of the four cells, since the 70 groups were divided into high and low levels of interpretation and integration using the median as a demarcation point. As can be seen from Table 5.7, there were 13 groups with an Impoverished schema, versus 22 groups with a Groupthink schema. In contrast, there were 23 groups with a Contentious schema, versus only 12 groups with a Productive schema. A chi-square analysis indicated a significant difference in the frequency of schema types with a chi-square statistic of 5.719, significant at .017. This means that it is highly unlikely that the differences in number of groups in each quadrant could be explained by mere chance. Therefore, *the results of the chi-square analysis provide strong support for hypothesis 5 which indicated that there would be more Groupthink groups than Impoverished groups, and more Contentious groups than Productive groups.* The implications of these findings relate to the difficulty and consequences of integrating diverse and complex schemas. While Productive groups had the highest performance, there were only 12 of the 34 high interpretation groups who were able to integrate their diversity and complexity. Furthermore, the Contentious groups, who were not able to integrate their diverse and complex schemas, had the lowest performance overall.

Hypothesis 1: Integration and Performance

Hypothesis 1 stated that groups with high integration were expected to perform better than groups with low integration. In support of hypothesis 1, Table 5.7 indicates that groups with high integration had a higher mean cnmc ($603.2) than groups with low integration ($316.4). However, it is necessary to examine the results of the ANOVA shown in Table 5.8 to determine whether the difference in mean cnmc is significant.

TABLE 5.8 ANOVA: INTERPRETATION BY INTEGRATION BY PERFORMANCE

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F VALUE	SIG. OF F
Main Effects	1445918.625	2	722959.312	8.073	.001**
Integration	1266632.699	1	1266632.699	14.145	.000**
Interpretation	7067.550	1	7067.550	.079	.780
2-Way Interaction	91122.531	1	91122.531	.018	.317
Explained	1537041.155	3	512347.052	5.722	.002**
Residual	5910120.839	66	89547.285		
Total	7447161.995	69	107929.884		

* significant at .05

The results from the ANOVA indicate that the main effect for integration, with an F value of 14.145 is highly significant at .000. Since there is no significant two way interaction between interpretation and integration as indicated by the low F value of .018, the main effects for integration provide strong support for hypothesis 1, clearly indicating that Groupthink and Productive groups performed better than Impoverished and Contentious groups.

Hypothesis 2: Interpretation, Integration and Performance

Hypothesis 2 stated that groups with high interpretation would only perform well if they also had high integration. Therefore, it was expected that Productive groups would perform better than Groupthink groups, both of whom would perform better than Impoverished and Contentious groups. Table 5.7 indicated the expected pattern of relationships; however, the ANOVA in Table 5.8 indicated that there was no significant two-way interaction. Table 5.9 displays the results of the contrasts among the four schema types. As indicated, four of the six possible contrasts are significant at the .05 level using independent T-tests. Newman Keuls analysis, which takes into account multiple contrasts, supported the results of the T-tests at the .10 level. The .10 level is substantiated given the one-tailed or directional nature of the contrasts. In support of hypothesis 2, Productive groups outperformed Impoverished and Contentious groups, as did Groupthink groups. There was no significant difference in performance between Impoverished and Contentious groups, as expected. However, there was no support for the expected difference in performance between Groupthink and Productive groups. Since the analysis and results of the variations of the basic model will provide insight into the non-significant findings between the performance of Groupthink and Productive groups, a discussion of these results is reserved until the analysis of the other models has been presented.

TABLE 5.9 ANOVA: CONTRASTS OF SCHEMA TYPES

SCHEMA TYPES	T VALUE	T PROBABILITY
Impoverished - Contentious	.903	.370
Impoverished - Groupthink	-1.976	.052**
Impoverished - Productive	-2.202	.031**
Contentious - Groupthink	-3.369	.001**
Contentious - Productive	-3.355	.001**
Groupthink - Productive	-.530	.598

The foregoing discussion has presented the analysis and results of hypotheses 1, 2, and 5 for the basic model. There was strong support for hypotheses 1 and 5, and moderate support for hypothesis 2. To test hypotheses 3 and 4, it is necessary to examine the two dimensions of interpretation separately, as was indicated in Figure 5.3. Therefore, the following section presents the analysis of the relationship between view divergence, integration and performance. The subsequent section presents the analysis of the relationship between schema complexity, integration and performance.

View Divergence, Integration and Performance

Hypothesis 3: View Divergence and Performance

Hypothesis 3 stated that when view divergence alone was used as a measure of interpretation, it was expected that Impoverished groups would perform better than Contentious groups. Although the results from the test of hypothesis 1, presented above, supported the importance of being able to integrate diverse and complex views, it was expected that it would be more difficult to integrate diversity than complexity. Therefore, since neither Impoverished or Contentious groups achieved integration, it was expected that Impoverished groups, having a lower level of initial diversity, would be able to take more concerted action than Contentious groups, who had a higher level of diversity. Table 5.10 shows the mean cnmc and cell frequencies for the high and low levels of view divergence relative to the high and low levels of integration. It must be recognized that view divergence is only one dimension of interpretation, and therefore the cells do not correspond directly to the four basic schema types. For this reason, Table 5.10 numbers the cells to emphasize that they do not take into account the second dimension of interpretation, schema complexity.

In support of hypothesis 3, Table 5.10 indicates that groups in Cell 1 with a mean cnmc of $459.7 had higher performance than groups in Cell 2 with a mean cnmc of $235.4. However, it is necessary to examine the specific contrasts to determine whether the differences are significant, as discussed below.

TABLE 5.10 VIEW DIVERGENCE BY INTEGRATION: Cell Means and Frequencies

INTEGRATION	VIEW DIVERGENCE: LOW	VIEW DIVERGENCE: HIGH	TOTAL
LOW	CELL 1 $\bar{X}$ CNMC = \$459.7 (13 Groups)	CELL 2 $\bar{X}$ CNMC = \$235.4 (23 Groups)	$\bar{X}$ CNMC = \$316.4 (36 Groups)
HIGH	CELL 3 $\bar{X}$ CNMC = \$582.2 (22 Groups)	CELL 4 $\bar{X}$ CNMC = \$643.7 (12 Groups)	$\bar{X}$ CNMC = \$603.2 (34 Groups)
TOTAL	$\bar{X}$ CNMC = \$536.08 (35 Groups)	$\bar{X}$ CNMC = \$375.34 (35 Groups)	$\bar{\bar{X}}$ CNMC = \$455.7 (70 Groups)

$\bar{X}$ CNMC = Mean cumulative net marketing contribution in millions of dollars

In general, Table 5.10 indicates the same pattern of performance as was found in the basic model. Productive groups had the highest performance, followed by Groupthink, Impoverished and Contentious groups. However, it can be seen that groups in Cell 1 had a higher mean cnmc at \$459.7 million than the \$376.3 million of the comparable Impoverished groups shown in Table 5.7. As found in the basic model, a chi-square analysis indicated a significant difference in the frequency of groups found in each cell with a chi-square statistic of 5.719, significant at .017, providing additional support for the difficulty of integrating diversity, as stated in hypothesis 5.

A two-way ANOVA of view divergence, integration and performance indicates further support for hypothesis 1, given the integration main effect of 13.117, significant at .001, as shown in Table 5.11. However, since there is a significant interaction effect as indicated by the F value of 3.92, it is necessary to examine the specific contrasts to determine whether the effects of integration hold for both of the high integration schema types.

TABLE 5.11 ANOVA: VIEW DIVERGENCE, INTEGRATION AND PERFORMANCE

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F VALUE	SIGNIFICANCE OF F
Main Effects	1557117.489	2	778558.745	9.242	.000**
Integration	1104979.980	1	1104979.980	13.117	.001**
View Divergence	118266.414	1	118266.414	1.404	.240
2-Way Interaction	330231.602	1	830231.602	3.920	.052
Explained	1887349.092	3	629116.364	7.468	.000**
Residual	5559812.903	66	84239.589		
Total	7447161.995	69	107929.884		

** - significant at .05

Further insight into the relationship between view divergence and integration is gained by looking at the contrasts between the cells as summarized in Table 5.12.

TABLE 5.12 CONTRASTS OF CELLS: VIEW DIVERGENCE

CELL CONTRAST	T VALUE	T PROBABILITY
Cell 1 - Cell 2	2.228	.029**
Cell 1 - Cell 3	-1.196	.236
Cell 1 - Cell 4	-1.583	.118
Cell 2 - Cell 3	-3.996	.000**
Cell 2 - Cell 4	-3.951	.000**
Cell 3 - Cell 4	-.600	.551

* significant at .05

In support of hypothesis 3, the contrasts show that groups with low view divergence and low integration (cell 1) outperformed groups with high view divergence and low integration (cell 2). In spite of the interaction effect found in the ANOVA, the two high integration schema types in cells 3 and 4 had the same relationship with the low integration types. Cells 3 and 4 were found to outperform cell 2, but not cell 1. The results provide support for hypothesis 1 on the importance of integration since, on average, the high integration groups outperformed the low integration groups, and the two high integration groups had the same pattern of results. The improved performance of cell 1 narrowed the difference in performance among groups in cell 1 and groups in cells 3 and 4. Therefore, there was no significant difference in performance between groups in cells 1, 3 and 4. However, cell 2 still showed significant differences in performance with cells 3 and 4, as was found in the basic model.

In summary, there was strong support for hypothesis 3, that groups with low view divergence and low integration would perform better than groups with high view divergence and high integration. There was also support for the importance of integration as stated in hypothesis 1, and the difficulty of integrating diversity as stated in hypothesis 5.

Schema Complexity, Integration and Performance

Hypothesis 4: Schema Complexity and Performance

Hypothesis 4 stated that when schema complexity alone is examined as a measure of interpretation, groups with high schema complexity and low integration would perform better than groups with low schema complexity and low integration. The cell means for cnmc and the frequencies of the 70 groups for high and low levels of schema complexity and integration are shown in Table 5.13.

Table 5.13 illustrates the same pattern of results for the rank order of performance of the four schema types as was found for the basic model, and the variation of the basic model which focused on view divergence alone, indicating that hypothesis 4 was not supported: groups with high schema complexity and low integration did not perform better than groups with low schema complexity and low integration. As well, a chi-square analysis indicated no significant difference in the frequency of groups in each cell.

TABLE 5.13 SCHEMA COMPLEXITY BY INTEGRATION: Cell Means and Frequencies

		SCHEMA COMPLEXITY LOW	SCHEMA COMPLEXITY HIGH	TOTAL
INTEGRATION	LOW	CELL 1 $\bar{X}$ CNMC* = \$343.9 (Groups = 17)	CELL 2 $\bar{X}$ CNMC = \$291.8 (Groups = 19)	$\bar{X}$ CNMC = \$316.4 (Groups = 36)
	HIGH	CELL 3 $\bar{X}$ CNMC = \$562.24 (Groups = 18)	CELL 4 $\bar{X}$ CNMC = \$649.4 (Groups = 16)	$\bar{X}$ CNMC = \$603.2 (Groups = 34)
	TOTAL	$\bar{X}$ CNMC = \$456.2 (Groups = 35)	$\bar{X}$ CNMC = \$455.3 (Groups = 35)	$\bar{\bar{X}}$ CNMC = \$455.7 (Groups = 70)

* $\bar{X}$ CNMC = Mean cumulative net marketing contribution in millions of dollars

As shown in Table 5.14 hypothesis 1 received further support as indicated by the F value of 16.089 for the integration main effect, which was highly significant at .000. Since there was no significant two way interaction, the main effect can be interpreted as support for the hypothesis.

TABLE 5.14 ANOVA: SCHEMA COMPLEXITY BY INTEGRATION BY PERFORMANCE

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F VALUE	SIG. OF F
Main Effects Integration Schema Complexity	1443050.828 1443035.831 4199.753	2 1 1	721525.414 1443035.831 4199.753	8.044 16.089 .047	.001** .000** .829
2-Way Interaction	84395.444	1	84395.444	.941	.336
Explained Residual Total	527446.271 5919715.724 7447161.995	3 66 69	509148.757 89692.662 107929.884	5.677	.002**

** significant at .05

The contrasts between cells summarized in Table 5.15 shows the same pattern of significant contrasts as was found for the basic model. Groups in Cells 3 and 4 outperformed groups in Cells 1 and 2 indicating, that based on schema complexity alone, Productive and Groupthink groups outperformed Contentious and Impoverished groups.

TABLE 5.15 CONTRASTS OF CELLS: SCHEMA COMPLEXITY

CELL CONTRAST	T VALUE	T PROBABILITY
Cell 1 - Cell 2	.521	.604
Cell 1 - Cell 3	-2.156	.035**
Cell 1 - Cell 4	-2.929	.005**
Cell 2 - Cell 3	-2.745	.008**
Cell 2 - Cell 4	-3.519	.001**
Cell 3 - Cell 4	-.847	.400

In summary, the analysis of schema complexity alone did not provide support for hypothesis 3 which stated that groups with high schema complexity and low integration would perform better than groups with low schema complexity and low integration. However, the lack of support for the importance of schema complexity may be attributed more to the measurement of the construct, than a weakness in the theory. The results provided further support for the link between integration and performance as stated in hypothesis 1.

The foregoing sections presented the results of the basic model and the two sub-dimensions of interpretation, view divergence and schema complexity, for all 70 groups regardless of the industry in which they operated or the group's start position within the industry. In Chapter IV, it was stated that the 70 groups were divided into 14 industries of 5 groups each. Each of the five groups began with an equal 20% market share, but with a different set of products, having differing levels of consumer awareness, product characteristics and product positioning within each segment. The 14 industries were mirrors of each other, given that they each had five groups, with group 1 of each industry beginning with the same set of products. While there was interaction among groups in an industry, there was no interaction between industries. Therefore, the actions of group 1 in industry 1 would affect group 2 in the same industry, but its actions would not impact group 1 in industry 2. An analysis of variance of performance by both start position (group) and industry was conducted to determine whether there was any significant difference in performance between industries or group start position. If there was no significant difference in performance by industry or group start position, the analysis could combine all 70 groups as has been assumed thus far. However, if there were differences in performance as a result of the effect of either industry or group start position, further analysis would be required to determine whether the results found for the entire 70 groups held for the different industries or group start positions identified.

An analysis of variance of performance by industry indicated no significant difference in performance, with an F ratio of .1099 as shown in Table 5.16, indicating that the mean cnmc of each of the industries was not significantly different from the performance of any of the other 14 industries. Therefore group 1 of industry 1 had no advantage over group 1 from industry 14, for example. Furthermore, the performance of the industries comprised of undergraduates was compared to the performance of the industries comprised of graduates. The analysis of variance yielded an F ratio of .5849 which was not significant at .45. As a result, the 14 sets of 5 group industries could be combined in the analysis and testing of the hypotheses.

TABLE 5.16 ANOVA: PERFORMANCE BY INDUSTRY

Source	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
Between Groups	13	185293.6149	14253.3550	.1099	.9999
Within Groups	56	7261868.380	129676.2211		
Total	69	7447161.995			

INDUSTRY	NUMBER OF GROUPS	MEAN CNMC*	STANDARD DEVIATION
Industry 1	5	442.4600	348.1050
Industry 2	5	561.5600	430.6100
Industry 3	5	450.7600	295.1444
Industry 4	5	481.4400	524.8549
Industry 5	5	532.6200	274.4707
Industry 6	5	492.3600	386.4274
Industry 7	5	445.1400	292.5027
Industry 8	5	448.0200	289.6690
Industry 9	5	483.3000	442.4802
Industry 10	5	398.4800	292.5695
Industry 11	5	380.2600	194.0434
Industry 12	5	462.1600	515.9776
Industry 13	5	371.2200	198.0238
Industry 14	5	430.1400	357.3110
Total	70	455.7086	328.5268

* Mean cumulative net marketing contribution in millions of dollars.

An analysis of variance of performance based on the start position of the group indicated a significant difference in performance between groups starting in each of the 5 possible start positions with an F value of 13.604 as shown in Table 5.17. A Scheffe test indicated that groups starting in positions 1,3 and 5 were significantly different from groups beginning in positions 2 and 4. Neuman Keuls analysis supported the results of the Scheffe test.

TABLE 5.17 ANOVA: PERFORMANCE BY GROUP

Source	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
Between Groups	4	3393525.123	848381.2809	13.604	.0000**
Within Groups	65	4053636.871	62363.6442		
Total	69	7447161.995			

** significant at .05

START POSITION	NUMBER OF GROUPS	MEAN CNMC*	STANDARD DEVIATION
Group 1	14	183.0643	153.1735
Group 2	14	731.5214	325.9671
Group 3	14	285.3857	227.3476
Group 4	14	695.8214	280.6756
Group 5	14	382.7500	227.2352
Total	70	455.7086	328.5268

* Mean cumulative net marketing contribution in millions of dollars.

SCHEFFE TEST INDICATES TWO SUBSETS

SUBSET 1			
Group Start Position	Group 1	Group 3	Group 5
Mean CNMC	183.0643	285.3857	382.7500
SUBSET 2			
Group Start Position	Group 2	Group 4	
Mean CNMC	731.5214	695.8214	

There was a significant difference in performance between the 28 groups starting in positions 2 and 4, and the 42 groups starting in positions 1,3 and 5. As a result, groups 2 and 4, having a higher level of mean cnmc were labelled as the favoured groups, while groups 1, 3 and 5, with a lower mean cnmc were labelled as the unfavoured groups, for the purpose of further analysis.

A three way ANOVA with interpretation, integration and group start position as the independent variables, and performance as the dependent variable, was conducted to determine whether group start position interacted with interpretation and integration. A three way interaction would indicate that there was a different pattern of results between interpretation and integration for each of the two subsets. The three way interaction with an F value of 3.128 was not significant at .082. The results do not provide definitive evidence that the favourable and unfavourable start positions interact with interpretation and integration in order to generate different results for the two subsets. However, the high F value of 3.128 provides compelling evidence to suggest that the effects of group start position cannot be ignored. Therefore the basic model, which focused on the levels of interpretation and integration for all 70 groups, as was discussed previously, was analyzed for the two sub-groups consisting of: 1) the 28 groups beginning in favourable positions; and 2) the 42 groups beginning in unfavourable positions. The same three-part analysis that was undertaken for the 70 groups was also carried out for the two sub-groups. However, it was previously stated that the non-orthogonal nature of the data creates a more difficult test of the hypotheses. This problem is further compounded in the analysis of the two sub-sets by a significantly smaller sample size. Therefore, while statistically significant results provide strong support for the hypotheses, non-significant results cannot be taken as a rejection of the hypotheses.

Basic Model: Interpretation and Integration (Favoured Groups)

A variation of the basic model, indicating the mean cnmc for the subset of the 28 favoured groups along the dimensions of interpretation and integration is shown in Table 5.18. Although there is the same pattern of results regarding the rank performance of the four schema types as was found for all 70 groups, the Impoverished groups did considerably better when beginning in a favourable start position than was found for Impoverished groups overall.

TABLE 5.18 INTERPRETATION AND INTEGRATION (FAVOURED GROUPS):

Means and Frequencies

INTEGRATION	INTERPRETATION: LOW	INTERPRETATION: HIGH	TOTAL
LOW	IMPOVERISHED SCHEMA $\bar{X}$ CNMC* = \$714.6 (Groups = 5)	CONTENTIOUS SCHEMA $\bar{X}$ CNMC = \$487.3 (Groups = 5)	$\bar{X}$ CNMC = \$601.0 (Groups = 10)
HIGH	GROUPTHINK SCHEMA $\bar{X}$ CNMC = \$727.1 (Groups = 12)	PRODUCTIVE SCHEMA $\bar{X}$ CNMC = \$874.6 (Groups = 6)	$\bar{X}$ CNMC = \$776.3 (Groups = 18)
TOTAL	$\bar{X}$ CNMC = \$723.4 (Groups = 17)	$\bar{X}$ CNMC = \$698.6 (Groups = 11)	$\bar{X}$ CNMC = \$713.7 (Groups = 28)

* $\bar{X}$ CNMC = Mean cumulative net marketing contribution in millions of dollars

The ANOVA shown in Table 5.19 indicates a stronger interaction effect between interpretation and integration, but an insignificant main effect for integration for the favoured groups, than was found overall in contrast to the significant effects found for all 70 groups.

TABLE 5.19 ANOVA: INTERPRETATION, INTEGRATION AND PERFORMANCE

(FAVOURED GROUPS)

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F VALUE	SIGNIFICANCE OF F
Main Effects	197654.755	2	98827.377	1.186	.323
Integration	193534.402	1	193534.402	2.322	.141
Interpretation	74.123	1	74.123	.001	.976
2-Way Interaction	216098.148	1	216098.148	2.592	.120
Explained	413752.903	3	137917.634	1.655	.203
Residual	2000601.855	24	83358.411		
Total	2414354.757	27	89420.547		

The contrasts of schema types for the favoured groups indicates only one significant contrast as shown in Table 5.20. Given the high performance of the Impoverished groups, they were not found to be significantly different from Groupthink and Productive groups, as was the case when all 70 groups were examined. However, the performance of Contentious and Productive groups remained significantly different from each other, as was found when all 70 groups were examined.

TABLE 5.20 ANOVA: CONTRASTS OF SCHEMA TYPES (FAVOURED GROUPS)

SCHEMA TYPES	T VALUE	T PROBABILITY
Impoverished - Contentious	1.245	.225
Impoverished - Groupthink	-.042	.967
Impoverished - Productive	-.915	.369
Contentious - Groupthink	-1.521	.141
Contentious - Productive	-2.215	.036**
Groupthink - Productive	-1.063	.298

** significant of .05

Basic Model: Interpretation and Integration (Unfavoured Groups)

A variation of the basic model, indicating the mean cnmc for the sub-set of 42 unfavoured groups along the dimensions of interpretation and integration is shown in Table 5.21. There is a different pattern of performance for the unfavoured groups than was found for either the sub-set of 28 favoured groups or the population of 70 groups. The Impoverished groups had a relatively lower level of performance than the Contentious groups, while the Groupthink and Productive groups had virtually comparable performance to each other.

TABLE 5.21 INTERPRETATION & INTEGRATION (UNFAVOURED GROUPS): Means and Frequencies

	INTERPRETATION: LOW	INTERPRETATION: HIGH	TOTAL
INTEGRATION: LOW	IMPOVERISHED SCHEMA $\bar{X}$ CNMC* = \$164.9 (Groups = 8)	CONTENTIOUS SCHEMA $\bar{X}$ CNMC = \$225.6 (Groups = 18)	$\bar{X}$ CNMC = \$206.9 (Groups = 26)
INTEGRATION: HIGH	GROUPTHINK SCHEMA $\bar{X}$ CNMC = \$410.4 (Groups = 10)	PRODUCTIVE SCHEMA $\bar{X}$ CNMC = \$405.5 (Groups = 6)	$\bar{X}$ CNMC = \$408.6 (Groups = 16)
TOTAL	$\bar{X}$ CNMC = \$301.3 (Groups = 18)	$\bar{X}$ CNMC = \$270.6 (Groups = 24)	$\bar{\bar{X}}$ CNMC = \$283.7 (Groups = 42)

* $\bar{X}$ CNMC = Mean cumulative net marketing contribution in millions of dollars

The analysis of variance shown in Table 5.22 indicates a strong main effect for integration with an F value of 10.204, but a weaker interaction effect than was found for the favoured groups, indicating that while integration is critical, it does not interact with interpretation.

TABLE 5.22 ANOVA: INTERPRETATION, INTEGRATION AND PERFORMANCE

(UNFAVOURED GROUPS)

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F VALUE	SIG. OF F
Main Effects	413597.757	2	206798.879	5.224	.010**
Integration	403914.097	1	403914.097	10.204	.003**
Interpretation	10895.024	1	10895.024	.275	.603
2-Way Interaction	9646.883	1	9646.883	.244	.624
Explained	423244.640	3	141081.547	3.564	.023**
Residual	1504136.933	38	39582.551		
Total	1927381.573	41	47009.307		

** significant at .05

The contrasts of schema types for the unfavoured groups shown in Table 5.23 indicate the same pattern of relationships as was found for all 70 groups, with the exception of the contrast between Contentious and Productive groups which had a lower T value than was found for the same contrast using all 70 groups. As a result, the performance of Impoverished groups was significantly different from both Groupthink and Productive groups, while the performance of Contentious groups was significantly different from only the Groupthink groups.

TABLE 5.23 ANOVA: CONTRASTS OF SCHEMA TYPES (UNFAVOURED GROUPS)

SCHEMA TYPES	T VALUE	T PROBABILITY
Impoverished - Contentious	-.718	.477
Impoverished - Groupthink	-2.601	.013**
Impoverished - Productive	-2.239	.031**
Contentious - Groupthink	-2.355	.024**
Contentious - Productive	-1.918	.063
Groupthink - Productive	.048	.962

** significant of .05

In summary, the foregoing analysis of the variations of the basic model for the sub-sets of favoured and unfavoured groups indicated a different pattern of relationships than was found for the population of 70 groups. For the 28 groups starting in a favourable start position, the effect of integration on performance was not significant, while the interaction effect between interpretation and integration was quite strong, indicating that a high level of interpretation had value only if accompanied by a high level of integration. Impoverished, Groupthink and Productive groups had comparable performance, while the performance of Contentious groups was significantly lower than Productive groups. The results may suggest that the key ingredient in achieving better performance is to take concerted action. For Groupthink and Productive groups, who have a high level of integration, taking concerted action is not difficult. Although Impoverished groups do not have a high level of integration, they have a low level of view divergence, making it more amenable to taking concerted action than Contentious groups who have a high level of diversity, yet no integration. For the 42 groups beginning in an unfavourable start position, the importance of integration was more evident. Productive and Groupthink groups outperformed Contentious and Impoverished groups. The results from the analysis of the groups starting in an unfavourable position suggest that in the face of adversity (i.e. unfavourable start position), integration is more critical than when there is less adversity.

As indicated in Figure 5.3, presented at the outset of this Chapter, the results of the analysis of view divergence and schema complexity for favoured and unfavoured groups is presented in Appendix 5A. The patterns found support the results of the models already presented.

Summary

When all 70 groups were examined there was strong support for the link between integration and performance as outlined in hypothesis 1. Although there was definitive evidence that group start position affected performance, there was no definitive evidence that group start position affected the relationship between interpretation and integration. However, there was sufficient evidence to consider the effects of group start position on the two independent variables. Therefore, it was found that for groups beginning in an unfavourable start position, integration was far more critical than for groups beginning in a favourable start position.

There was moderate support for hypothesis 2, which suggested that groups with high interpretation would only perform if they also had high integration. Productive and Groupthink groups were found to outperform Contentious and Impoverished groups when all 70 groups were examined. However, there was no significant difference in performance between Productive and Groupthink groups. For the sub-set of 42 groups with an unfavourable start position, the same pattern of results was found as for the total population, whereas for the sub-set of groups with a favourable start position, Impoverished groups performed considerably better than Impoverished groups from the total population.

There was strong support for hypothesis 3, which stated that for groups with low integration, groups having a low level of view divergence would perform better than groups with a high level of view divergence. When only the dimension of view divergence was considered, Impoverished groups performed better than Contentious groups.

Although there was no support for hypothesis 4, which stated that for groups with low integration, groups with high schema complexity would perform better than groups with low schema complexity, this finding may be attributed to the measure of schema complexity.

Hypothesis 5 regarding the frequency of schema types received strong support, indicating that there were significantly more Groupthink groups than Impoverished groups, and more Contentious groups than Productive groups.

VIDEO-TAPE

In addition to the quantitative data obtained from the questionnaires, qualitative data was obtained from the video tape of the discussions of five groups who volunteered to be taped during the simulation. As shown in the chart below, in terms of final ranking on performance, one of the groups ranked first in its industry, two ranked second, one ranked third and one ranked fourth. Two groups were from the same industry, ranking first and second in that industry.

Group	**Start Position in Industry**	**Industry**	**Final Rank in Industry**
1	3	2	3/5
2	2	4	2/5
3	5	6	4/5
4	3	7	2/5
5	4	7	1/5

Although the video groups had a higher mean level of performance, an analysis of variance indicated that there was no significant difference in performance between groups who were video-taped and those who were not. Since groups with favoured start positions had higher performance, the groups were divided into those with favoured and unfavoured start positions. An analysis of variance indicated no difference in performance between groups video taped and those who were not for the two sub-samples.

From the strategic planning forms the groups handed in for period 4 of the simulation, and from the video-tapes of the final presentations made by 40 of the 70 groups, a profile for the 40 groups was constructed. A profile of 8 of the 14 industries in which the 40 groups operated is provided in Appendix 5D. Profiles of the 40 groups are provided in Appendix 5E.

The video-tape was used for exploratory rather than confirmatory analysis. Tapes were reviewed for any insights they might provide into what transpired in the groups. The findings from this analysis are presented in Chapter VI to augment the findings of the confirmatory analysis undertaken.

SUMMARY

In summary, the test of the hypotheses indicated strong support for hypothesis 1, which suggested that groups with higher integration would have higher performance. However, for groups with a favourable start position, the strength of the relationship between integration and performance weakened considerably. Hypothesis 2 received moderate support. Productive and Groupthink groups were found to outperform both

Impoverished and Contentious groups. However, there was no significant difference in performance between Productive and Groupthink groups. Hypothesis 3, which indicated that groups with low view divergence and low integration would perform better than groups with high view divergence and low integration received strong support. There was no support for hypothesis 4, which suggested that groups with high schema complexity and low integration would perform better than groups with low schema complexity and low integration. Hypothesis 5 received strong support, indicating that there were significantly more Groupthink groups than Impoverished groups, and conversely, more Contentious groups than Productive groups. This finding suggests that it is extremely difficult to integrate the high level of diversity found in the Contentious groups, whereas it is much easier to integrate the low level of diversity found in Impoverished groups.

The following chapter discusses these results in further detail and outlines a research agenda based on the findings.

CHAPTER VI - THE IMPLICATIONS: DISCUSSION AND RESEARCH AGENDA

This dissertation has had two agendas. The first agenda was the development of a sociocognitive model of strategic management that was firmly rooted within an organization learning paradigm. The impetus for developing the model arose from the recognition that the "rational" and "information" perspectives of strategic management discussed in Chapter II, have neglected the central role managerial cognition plays in guiding interpretation and actions. As pointed out by Daft and Huber (1987), the traditional notion of strategic management, which suggests that performance arises from the fit between an organization's strategy and its internal and external environment, neglects the critical question of how organizations learn about their environment and take actions. Furthermore, as discussed in Chapter I, if competitive advantage arises from an organization's ability to learn faster than its competitors, it is paramount that management theorists draw on and extend current theories of organization learning. The sociocognitive model developed in Chapter II extends conventional notions of strategic management to provide insight into how organizations learn about their environment and take action.

While this dissertation has extended management theory through the development of a sociocognitive model of strategic management, the second agenda of this dissertation was to develop the methodology for research in the cognitive domain. Therefore, the empirical portion of this research was designed to test the hypotheses regarding the relationship between organization schemas and performance as outlined in Chapter IV. As well, the study was designed to apply and extend our understanding of methodologies for measuring cognitive schemas. In Chapter V, the analysis and results of the tests of the hypotheses, and the analysis of the construct measures and their dimensionality was presented. Chapter VI synthesizes the analyses and discusses the results, and presents the implications for management. As well, the limitations of the study are examined, followed by an agenda for future research.

SYNTHESIS AND DISCUSSION

Given the two agendas of the empirical portion of this dissertation, to test the hypotheses, and to develop the cognitive measures, this section synthesizes and discusses how the results affected each agenda, beginning with a summary of the key findings of the study. The summary is divided into findings relating to the hypotheses, to the measures and methodology, and finally, to the theory. Although the summary of the findings for the hypotheses relates directly to the theory, the theory section is intended to provide a summary of the findings for which there has been empirical support in light of the over-arching theories presented in Chapters I and II.

Summary of the Key Findings

Hypotheses

1. There was strong support for the importance of integration (Hypothesis 1). Groups with a high level of integration outperformed groups with a low level of integration. The effect was the strongest for groups who began in an unfavourable start position.

2. Level of interpretation was not positively related to performance, but rather it was moderated by the level of integration, as expected (Hypothesis 2). Therefore groups with high interpretation (Productive and Contentious groups) only performed well if they had high integration (Productive groups). In fact, Contentious groups had consistently poor performance in every test conducted. However, the expectation that Productive groups would perform better than Groupthink groups was not supported.

3. There was strong support for the expectation that it would be difficult to integrate complex and diverse schemas (Hypothesis 5). Given the difficulty of integrating diversity, there were more groups with high diversity and low integration (Contentious groups) than groups with high diversity and high integration (Productive groups). As well, since a low level of diversity was easier to integrate, there were more groups with low diversity and high integration (Groupthink groups) than groups with low diversity and low integration (Impoverished groups).

4. When the results summarized in points 2 and 3 are taken together, the findings suggest that there is a high risk in trying to integrate diversity, since diversity that is not integrated leads to very poor performance, and achieving integration is difficult.

5. In the case of groups with low integration, low view divergence was associated with better performance, as expected (Hypothesis 3). The findings suggest that in the absence of being able to achieve support and understanding for decisions, a low level of divergence may enable the group to take more concerted action than groups having a higher level of view divergence. That is, while groups with low view divergence do not support and understand the decisions, they are likely to experience less disagreement than groups with a high level of view divergence.

6. Contrary to expectations, in the absence of integration, groups with high schema complexity did not perform better than groups with low schema complexity (Hypothesis 4). This result may be attributed to the measure of

schema complexity as summarized below.

Measures and Methodology

7. The fixed-form approach for eliciting cause maps enhanced the measure of view divergence, since it provided a basis to compare cause maps. However, this method sacrificed the individuality of the cause maps and, hence, the variability in the schema complexity measure.

8. The cause map was found to be a powerful tool to examine the relationship between cognitive diversity and performance.

9. The divergence on the structure of the cause map was found to be highly correlated with the divergence of views on the strength of the relationships in the cause map. Since obtaining the strength of the relationship is a tedious task, these findings suggest that the task may not be necessary.

10. Individuals tended to report a higher level of consistency between the divergence of views at the beginning and end of the simulation than was found in either the diversity on ranking or the cause map. This finding may indicate that individuals are not aware of the actual diversity that exists.

11. The diversity on the cause maps was more resistant to change than was the diversity on rank, suggesting that cause maps may be more stable structures.

12. The weighted measures of view divergence and schema complexity based on influence and involvement did not contribute to any significant changes in the schema classification of groups. This finding was also supported by the pilot study.

Theory

13. The findings from the empirical portion of the dissertation provide strong support for the examination of cognitive constructs as predictors of performance.

14. While the high performance of Groupthink groups may be partially explained by the weak measure of schema complexity, it also suggests that Groupthink groups may have been able to generate frame-breaking diversity in the integrating process, as was observed in the video-tapes. These findings suggest that the integrating process should be an area of focus for future research.

15. The findings support the organization learning precept that performance should not be used to define whether learning has occurred. A favourable environment may be a stronger predictor of performance in the short term than any learning that has occurred in the group. The video-tapes suggest that a favourable environment may, in fact, inhibit learning.

16. In terms of the Consensus-Performance issue that has been debated in the strategic management literature for over a decade with no resolution, this dissertation has suggested that the measure of consensus does not allow researchers to distinguish among groups with Impoverished, Groupthink and Productive schemas. The findings of this study indicate that researchers need to take into account the temporal nature of view divergence, since Groupthink and Productive groups outperformed Impoverished groups. As well, the study provides support for a view of consensus that relates to support and understanding, rather than correspondence of views, as has been measured in the past.

Test of Hypotheses

The following sections discuss the results from the test of the hypotheses in greater detail.

Hypothesis 1 - Integration and Performance

The results of the study provide strong support for the importance of integration as stated in hypothesis 1. Productive and Groupthink groups consistently outperformed Contentious and Impoverished groups. As well, it was found that integration was more critical for groups beginning in an unfavourable start position than for groups beginning in a favourable start position. The results suggest that in the face of adversity, integration becomes more critical, since there is no slack to take actions that are not coherent or internally consistent. However, the impact of integration diminished for groups beginning in a favourable start position, as evidenced by the high performing Impoverished groups. Contentious groups contintued to have poor performance. The high performance of the Impoverished groups beginning in a favourable start position suggests that their low level of diversity may have facilitated taking coherent action in spite of the fact that the groups had a low level of integration. As well, the favourable environment may have provided more slack to take actions that were not internally consistent. However, in spite of the favourable environment, Contentious groups had very poor performance. This finding may be explained by their high level of diversity which made it difficult to take internally consistent actions.

Overall the results have provided insight into the nature and role of integration. It was argued in Chapter IV that a high level of integration or support and understanding will likely lead to internally consistent actions. In Markstrat this was evidenced by groups who coordinated their decisions on research and development, sales force allocation, production, advertising and pricing. Essentially, having internally consistent actions is evidence of efficiency in the allocation of resources. However, it was also argued that a high level of integration is likely the result of a process that allowed individuals to present their views and resolve differences. Support for this assertion was provided by the high correlation between the process measure of integrating and the content measure of integration. In fact, only 8 of the 70 groups had a high level of support and understanding in spite of having a poor process of integrating. As well, only 8 of the 70 groups scored high on the process and low on level of support and understanding. It was expected, therefore, that groups who engaged in an effective process and arrived at a high level of support and understanding would be more likely to make effective decisions; that is, the group was more likely to synthesize the various interpretations of group members to arrive at a collective interpretation which provided a high level of utility in guiding their actions relative to the Markstrat environment. It was also argued in Chapter IV that taking coherent or internally consistent actions is not necessarily indicative of a high degree of integration. In the study, this was evidenced by Impoverished groups who had a low level of diversity and low integration. The lack of diversity may have facilitated taking internally consistent actions.

In the Markstrat environment, groups did not have to implement their decisions. It is expected that the impact of integration will be even greater in organizations where a high level of support and understanding will lead to efficient (internally consistent) and effective actions, but also to a high level of commitment to the actions.

Hypothesis 2 - Interpretation and Performance

There was moderate support for the hypothesis that a high level of interpretation would only be beneficial if accompanied by a high level of integration. In support of the hypothesis, Contentious groups consistently had poor performance. However, contrary to what was expected, the results did not indicate any significant difference in performance between Productive and Groupthink groups. There are two factors which may explain the non-significant difference in performance between Groupthink and Productive groups. The first relates to the schema complexity construct which is one of the dimensions of level of interpretation. Its lack of explanatory power, as discussed in the measurement section that follows, reduces the likelihood of discriminating between the two types of schema. As well, it is possible that through the process of integrating, Groupthink groups were able to achieve some further divergence of views before they converged, and hence had the level of interpretation of Productive groups. However, the process of integrating was not the focus of the study and therefore, it is not possible to assess whether this divergent thinking in Groupthink groups actually occurred.

For groups in unfavourable start positions, Groupthink and Productive groups had more comparable performance than the groups in favourable start positions. A possible explanation of these findings is that adversity creates its own frame-breaking diversity and therefore the critical element is to try to integrate views. For example, groups in unfavourable positions constantly faced the difficult issue of whether they should rationalize their product lines or try to enter new markets in the hope of improving performance. Failure to arrive at a consensus about which strategy to adopt could leave a firm "stuck in the middle". In this case, either strategy may have been equally viable. The critical issue, therefore, is to develop support and understanding for the strategy in order to take coherent action.

Hypothesis 3 - View Divergence and Performance

Hypothesis 3 received strong support. It was expected that in cases where groups had a low level of integration, a low level of view divergence would facilitate taking concerted action. In other words, although the groups had a low level of integration, indicating they did not support or understand the decisions made by the group, they did not have a high level of diversity to start with, and as a result, their disagreements may have been minimal. Therefore, while a high level of view divergence provides the potential for a higher level of performance, if it is not integrated, it may be extremely difficult to take concerted action.

Hypothesis 4 - Schema Complexity and Performance

There was no support for hypothesis 4. It is likely that the non-significant results may be attributed to the weak measure of schema complexity as discussed below. Further research will be required to pursue the relationship between schema complexity and performance.

Hypothesis 5 - Frequency of Schema Types

Hypothesis 5 received strong support. There were significantly more Productive groups than Contentious groups, and conversely more Groupthink groups than Impoverished groups. The importance of this hypothesis relates to the difficulty of integrating diverse and complex schemas. Essentially, since level of interpretation refers to the potential that exists within the group, all 70 groups could be classified as either Impoverished or Contentious at the beginning of the simulation prior to having the opportunity to integrate their schemas. Therefore, Impoverished groups who subsequently integrate their schemas become Groupthink groups, while Contentious groups become Productive groups. The results of hypothesis 5 suggest that it is relatively easy for Impoverished groups to integrate their low level of diversity and complexity, and hence there are more Groupthink than Impoverished groups. Conversely, it is more difficult for Contentious groups to integrate their highly diverse and complex schemas and hence there are more Contentious than Productive groups. The results of hypothesis 5 taken together with the results of hypotheses 1 and 2 are very instructive. Given the consistently poor performance of Contentious groups and the difficulty of integrating the diverse and complex schemas which provide the groups with a high potential level of interpretation, the results suggest that developing a Productive schema is a risky proposition. Furthermore, given the high performance of Groupthink groups and the ease with which Impoverished groups were able to arrive at a high level of integration, this study raises some questions about the role and risks of diversity.

The foregoing discussion was based on the results of the statistical tests of the hypotheses. The following section discusses the qualitative analysis of the video-tapes as they relate to the hypotheses.

Insights from Video-tapes

The video-tapes of the 5 groups during the simulation, and the 40 groups during their final presentations provided further insight into the results of the tests of the hypotheses. As well, the researcher had the opportunity to present the results to over one quarter of the participants and to obtain their reactions, providing further insight into the results. The insights from the video-tapes and the feedback session are outlined below.

Contrary to what was expected, Productive groups did not have significantly higher performance than Groupthink groups. A possible explanation for the strong performance of Groupthink groups is that through the process of integration they were able to create diversity, and hence, were more like Productive groups than like Groupthink groups, who should have had low diversity. For groups beginning in an unfavourable start position, the unfavourable environment alone might have provided the stimulus for contention and diversity in the group. The video-tapes provided insight into the process of integration. It was observed that diversity was created in many groups by adopting a brand management or functional organizational approach to analyzing the data and making decisions. While for Groupthink groups the additional diversity may have been helpful, for Contentious groups the additional diversity may have added to the difficult task of integration. For example, one Contentious group stated that they adopted a brand management approach which created spirited rivalry among brands and enabled them to work through the voluminous data on a brand by brand basis. However, the group members found that this approach created conflicts of interest requiring too much negotiation. Since everyone had equal power, there was nobody to "draw the line", resulting in diluted decisions. One individual remarked that "in hindsight, I was very effective in getting budget for my product, which probably should have been dumped early on".

An Impoverished group, conveying what they had learned from the simulation, discussed the area of group dynamics, stating that:

> The group has to focus and work together...we came together, but we were focusing on each other instead of the market place. In the future we learned that you have to make sure that everyone is involved. You need to establish individual responsibilities and communicate. We set up in two separate rooms with two different computers and we found that all of the decision making that was made in one room got changed in the other and consequently our strategy reflected that lack of focus. You need to have superordinate goals and focus on the task instead of each other.

One of the Productive groups remarked on how they integrated their diversity:

> The most important factor in our success was having a clear strategy and clear objectives which enabled us to focus the group effort and resolve dissention in the group. Although we analyzed the data separately by functional area we got together as a group to make decisions. It seemed a little disorganized, but using the strategy as a benchmark we would make decisions.... It resulted in a structured, well balanced decision making process.

As well, the video-tapes provided insight into the precept presented in Chapter I, that determining whether learning has occurred should not be tied to performance based measures. Groups who began in a favourable start position had significantly higher performance than groups in the same industry who began in an unfavourable start position. The high performance of groups who began in favourable start positions may be explained by the fact that they had a significant amount of slack to make mistakes. Since the administrators had instructed the groups that they were all on an equal footing, groups beginning in a favourable start position were not aware of their advantage. It is interesting to note that many of these groups exhibited an inflated view of themselves in their final presentations, attributing their success to their brilliant strategies. The findings of the study seem to parallel reality very closely, since many organizations, perhaps riding the crest of a cycle, or protected from foreign competition by government policy, have not fostered the diversity or complexity of thinking that will enable them to survive in a more competitive environment (Miller, 1990). Perhaps the more serious problem is that they do not recognize how ill-prepared they are to be more competitive. Therefore, while a performance based measure of learning would have suggested that groups beginning in a favourable start position had "better" learning than groups beginning in an unfavourable start position, given their higher level of performance, it is likely that their performance was more attributable to a favourable environment than a higher degree of learning.

Furthermore, the favourable environment may inhibit performance. Their success, given the favourable environment, reinforces their actions, and therefore they fail to ask the questions that provide insight into their strategy. In contrast, groups in an unfavourable environment are forced to examine their strategies to determine why they are having poor performance. It is the recognition and resolution of the discrepancies in performance that is the basis for learning.

In summary, the foregoing section has discussed the results of the tests of the hypotheses in response to the first agenda of the empirical portion of this dissertation. Overall, the results are very encouraging. In spite of the fact that the dimensions of interpretation and integration were not independent (not orthogonal), since there was a different number of groups in each cell as was predicted in hypothesis 5, making it more difficult to obtain significant results, most of the hypothesized relationships were supported. Furthermore the quantitative and qualitative data provided further insight into the model, particularly with respect to the need for and role of integration in favourable and unfavourable environments. The support for the hypotheses not only provides support for the model, but also provides support for the measures used, as discussed in the section that follows.

Measurement of Constructs

The second agenda of the empirical portion of this dissertation was to apply and extend our understanding of methodologies for measuring cognitive schemas and other cognitive constructs such as view divergence and integration.

Since the methodology for measuring cognitive constructs is at an embryonic stage, it was decided to use multiple measures where possible. However, in using multiple measures, a key task was to assess their dimensionality. This section discusses the results of that analysis beginning with one of the two dimensions of interpretation, view divergence.

View Divergence

The results of the study provide strong support for the use of cause maps to measure cognitive diversity among individuals, and only moderate support for the use of diversity on rank alone. Although diversity on rank has frequently been used as a measure of divergence, the results indicate that diversity on rank captures a different kind of diversity than the diversity of cause maps, since diversity on rank captures diversity on the importance of the factors while diversity on the cause map captures diversity on the relationship between the factors. Therefore, although unforeseen, it is not surprising that the combined measure of initial diversity on rank and the cause map was the measure of view divergence that provided the best predictor of performance.

The self-report measures of initial view divergence obtained at the end of the simulation asked respondents to indicate the degree to which they shared views with other members of the group at the beginning of the simulation. The degree had a very low correlation with the actual diversity on rank and cause maps obtained at the beginning of the simulation. Although it is likely the self-report measure of shared views relates to a different kind of diversity than the more narrow focus of rank and the cause map, it may also indicate that individuals' subjective assessments of diversity are unreliable. As well, the high correlation between the beginning and ending self-report measures of view divergence suggests that individuals do not perceive a great deal of change in the level of diversity.

While there was a very low correlation between the beginning and ending measures of view divergence on rank, there was a significantly higher correlation between the beginning and ending view divergence on the cause map, indicating greater stability on the cause map measure than on rank. Although unforeseen, this result is not surprising, since it is expected that it would be much easier for an individual to change the ranking of a set of constructs than to alter a cause map that he or she has generated. For the respondents, the ranking task seemed much more abstract than drawing the cause map. The act of drawing from scratch a pattern of relationships, challenged and engaged their thought processes.

Two measures of divergence on the cause map were taken. One measure captured the divergence among individuals on the structure of the cause map; that is, whether they agreed that a relationship existed between any two factors. The other measure, captured the divergence on the strength of the relationship between the constructs. There was an extremely high correlation between divergence on the structure of the cause map and the measure of divergence on the cause map, a result which was partly attributable to the fact that the two measures are not independent. To reduce the independence, the measure of view divergence on the significance of the constructs was adjusted to capture diversity on significance for which there was agreement that a relationship existed. While the correlation was much lower, it still signified a large amount of common variance between the two measures, indicating that the level of significance may not add much further information. Given the difficulty of obtaining the level of significance for each relationship, researchers need to evaluate whether, in fact, obtaining the level of significance is necessary for their particular study.

Schema Complexity

A disappointment in the study was the measure of schema complexity, or as previously explained, the degree of differentiation and integration within an individual's schema. The more differentiated (number of constructs in the cause map) and the more integrated (number of relationships between constructs), the more complex the schema. However, the schema complexity measures of differentiation (number of constructs) and integration (number of relationships) did not generate any significant findings. Although the pre-test indicated variability in schema complexity, it may be that the respondents in the study were too homogeneous a group to demonstrate significant differences in level of complexity based on these measures. As well, the use of a fixed-form approach clearly reduced the potential variability in the schema complexity measure, since individuals could only use a maximum of 18 constructs. As well, since it was found that the number of relationships (individual integration) and the number of constructs (differentiation) have a high correlation, adopting a fixed-form method may have restricted the variability in both the number of constructs and the number of relationships. The high correlation between the beginning and ending measures of complexity support the fairly stable nature of the cause maps.

Theoretically, differentiation and integration are useful ways of describing schema complexity, as has been suggested by many researchers. However, the findings of this study should serve as a caution to researchers who attempt to measure schema complexity. Several concerns have surfaced. In Chapter IV, it was stated that there were two potentially conflicting considerations in eliciting schemas. The intent was: 1) to capture the complexity and individuality of schemas, while at the same time; 2) to capture schemas that could be compared across a large sample. Although the fixed-form approach reduced the individuality and therefore the variability in complexity, it also reduced any variability arising from different interpretations of the task, thereby eliciting schemas that could be compared on the same basis.

In summary, while a free-form approach to eliciting constructs might provide a better measure of schema complexity, it heightens the problem that the researcher may be dealing with cause maps at different levels of abstraction that are not comparable, thereby sacrificing any measure of view divergence.

Integration

The four item scale measuring the level of support and understanding group members had for the decisions made by the group proved to be a highly reliable scale with strong predictive validity. In contrast to the expectations of Woolridge and Floyd (1989), the items in the scale measuring agreement, support, and understanding were uni-dimensional, as opposed to separate measures of integration, or consensus. However, in an organizational setting where there is a greater likelihood of political posturing, and effects of power arising from the structure of the organization, there may be greater occasion for individuals to have conflicting positions on whether they agree, support and understand the decisions made by the organization. As well, the uni-dimensionality of the scale may have been an artifact of the instrument. Ideally, the use of two instruments would provide a stronger case for the dimensionality of the measure.

Since examining the process of integrating was not the focus of this study, the process measure of integrating was added only for exploratory purposes. Nevertheless the measure proved to be a highly reliable scale with high predictive validity. The high correlation between the process measure of integrating and the content measure of integration indicated that a high level of integration was more likely achieved if each member of the group: listened carefully to each other's ideas; utilized each member's skills and abilities; integrated everyone's perspective; cooperated; and developed a synthesis of viewpoints.

Of the measures of integration, the final measures of view divergence on cause map and rank measured a different type of integration than the three other measures of integration: 1) supund - the scale which measured the level of support and understanding; 2) discuss - the scale that measured the process of integrating; and 3) sve - the self-report measure of the degree to which individuals felt they shared similar views with other members in the group. As was stated in the development of the theory in Chapter II, developing an organization schema does not mean that the individual schemas need to completely overlap. Therefore, focusing on the variability in the final cause maps may be misleading. The high correlation between diversity on the cause maps at the beginning and at the end of the simulation suggests that cause maps are resistant to change. The focus, therefore, should not be on the diversity of cause maps as a measure of integration, since they may always reflect diversity, or at least require a longer time frame than was provided in the Markstrat simulation to manifest changes. Rather, the focus should be on whether, through the process of integrating, individuals were able to utilize the points of view of others to arrive at decisions the group supported and understood. These results also shed some light on the paradox of how groups achieve integration yet preserve diversity. Given the apparent resistance of cause maps to change, it appears there is less concern about preserving diversity than integrating diversity, as will be discussed in the sections that follow.

Influence and Involvement

The results of the t-tests indicated there was a significant difference between the levels of influence and involvement. Individuals tended to exhibit a greater level of involvement than influence, and individuals reported that members had more influence on others in the group than on the respondent. However the use of influence and involvement to weight the impact of any one individual on the group contributed to only a minimal redefinition of the classification of groups. The lack of difference between the weighted and unweighted measures was also found in the pilot study discussed in Chapter IV. Since groups were classified into one of four types of schema, it may be that the weighted measure changes their relative position with respect to other groups with the same schema, yet not enough to change the group's schema type. It is expected that in the context of real world organizations, the political manoeuvring of individuals may create a power imbalance, thereby creating a greater need for weighted measures. Therefore, although the weighted measures did not yield significantly different results in this study, it is recommended that future research should still attempt to obtain weighted measures.

Cause Maps

In general, collecting, coding and analyzing cause maps using the technique described in this dissertation is a time consuming and tedious task given the large sample. Great care must be taken in making sure the task is clear if the researcher expects to elicit comparable cause maps. As discussed, obtaining maps at the same level of abstraction would be difficult using a free-form approach, whereas using a fixed-form approach tends to minimize variability in complexity. There was an extremely high correlation between divergence on the structure of the cause map and the measure of divergence on the cause map which also incorporated the significance of the relationships, indicating that the level of significance does not add much further information. Since it was easy for respondents to miss identifying the strength of the relationship between constructs, a significant amount of the researcher's time was required to screen every cause map for missing information and recycle them to the respondents to obtain completed maps. Consideration should therefore be given to whether the task is required.

Summary

Overall, the results of the analysis of the measures have been encouraging. The pre-tests alone provided a great deal of insight into the task of collecting cause maps, and particularly, cause maps that could be compared across many individuals. The description of the guidelines for carrying out the task and the labels used for the factors are critical. Great care must be taken to reduce any ambiguity arising from the task to ensure that the cause maps are comparable.

The results of the study have provided support for the benefit of cause mapping techniques to measure cognitive diversity. The primary measure of integration, the level of support and understanding for decisions made by the group, proved to be highly reliable with strong predictive validity. As well, the process measure of integrating was also highly reliable with strong predictive validity. The measure of integration derived from the final cause map was not highly correlated with either the self-report measure of the degree to which group members shared views, or with the scale measuring support and understanding. This finding provides insight into the paradox of how diversity is preserved while at the same time integration is achieved. Although the cause maps were somewhat resistant to change, some groups were able to utilize the different points of view to arrive at decisions the group supported and understood.

MANAGEMENT IMPLICATIONS

No dissertation in the field of management would be complete without a discussion of the relevance of the study to management. Perhaps the best way to put the management implications into context is to draw on Miller's (1990) notion of "The Icarus Paradox". According to Miller:

> The fabled Icarus of Greek mythology is said to have flown so high, so close to the sun, that his artificial wax wings melted and he plunged to his death in the Aegean Sea. The power of Icarus' wings gave rise to the abandon that so doomed him. The paradox, of course, is that his greatest asset led to his demise. And that same paradox applies to many outstanding companies today: their victories and their strengths often seduce them into the excesses that cause their downfall. Success leads to specialization and exaggeration, to confidence and complacency, to dogma and ritual. (p. 3)

For many organizations, achieving the success of an Icarus is the primary concern; for others, sustaining success, and avoiding the fate of Icarus is the challenge.

While the traditional notions of strategic management have suggested that the performance of an organization is dependent upon the fit between the organization's strategy and its external and internal environment, this view has been of limited use to managers, since the critical issue they face is interpreting the environment and achieving this dynamic fit.

This dissertation has suggested three primary mechanisms for attaining and maintaining high performance as they relate to a management group's interpretation of the environment. The findings of the Markstrat study strongly support the importance of achieving **integration**. Productive groups, and even Groupthink groups who had a high level of integration, outperformed Contentious and Impoverished groups who had a low level of integration. Contentious groups, who began with a high level of diversity and complexity, but failed to integrate it, had the lowest performance overall. It is expected that the need for integration will be heightened in organizations where achieving commitment is necessary not only to make decisions, but also to implement them.

The importance of **view divergence** as an input to decision making was also supported by the findings of this research. However, nurturing divergence of views while also integrating them, is a difficult task as was evidenced by the relatively few groups in the simulation with a "Productive Schema". As Miller points out:

> Over time, most organizations become more internally consistent.
> Their strategies, for example, turn into ever more precise recipes and

> their cultures narrow to mirror the views and practices of a single group. Meanwhile, routines and systems become more entrenched, specialized, and pervasive. And all of these trends interact to produce tight configurations - but ultimately configurations that are distended, exaggerated, and lacking in richness and subtlety. Companies come to behave less like organisms and more like machines. Surprize and randomness, the sources of much knowledge, are lost. Before long, there is no more noise left in the system: no devil's advocates, no iconoclasts with any say, no countervailing models of the world. This of course, decreases flexibility and blocks learning. (p. 193)

Essentially, organizations who once had a Productive schema, may lose the diversity required to sustain their success and revitalize their schema. Without even realizing it, they develop a Groupthink schema. Or alternatively, their success at integration becomes the Icarus. By focusing on integration, they fail to nurture the diversity, or perhaps even discourage it.

Insights from the study indicate that groups beginning in a favourable start position may be more prone to the fate of Icarus. The favourable start position is similar to that of many organizations which may be riding the crest of a cycle, or are perhaps protected from competition by government intervention. Unfortunately, the organization's performance is not derived from the strength of an Icarus, but from the favourable environment. There is a tendency, however, for organizations to attribute good performance to internal factors and poor performance to external factors. By attributing the success arising from a favourable environment to internal factors, they act as if they have the strength of an Icarus. A case in point is the automobile industry. For several decades prior to the mid 1970's, the North American automobile industry was considered to be the epitome of U.S. industrial dominance. The phenomenal perfomance of the automotive giants reinforced their strategy of producing "big, powerful, and heavy cars, loaded with lots of options" (Halberstam, 1986). It took many years and a dramatic decline in performance before they were willing to interpret the signals from the environment indicating that consumers wanted fuel efficient cars.

The foregoing discussion raises an interesting issue regarding the impetus for learning. Porter (1990) has argued that organizations need an external catalyst to learn and innovate. That is, in the absence of a competitive environment, organizations are not willing or able to raise questions and take actions that enable them to interpret and resolve the gaps and conflicts that are the fuel for learning. Unfortunately, while the potential to learn exists for everyone, organizations frequently need competition or a crisis to set learning in motion.

Although there was no empirical support for the relationship between **schema complexity** and performance, there are insights to be gained from the theory. It was suggested that individuals with more complex schemas will be better equipped to interpret complex environments. As well, individuals who develop complex schemas reduce the need for diversity among individuals, since they themselves capture the diversity. Furthermore, if their schema is both highly differentiated and internally integrated, the problem of achieving external integration across individuals could be reduced. To illustrate this concept, organizations in the midst of globalization are faced with the decision of complicating the understanding of organization members either through culture and language training, for example, or by recruiting new members with diverse skills and understanding. However, what many organizations have failed to consider is the difficulty of integrating diverse views. And, as found in this study, failing to integrate diverse views, giving rise to a Contentious schema, may yield disastrous results.

One of the concerns, arising from the Markstrat simulation, was the number of Groupthink groups who, having inherited a favourable start position, attributed their success to themselves rather than to a favourable environment. It is suggested that a lack of schema complexity about one's key success factors may be tolerated in a favourable environment, but will not support an organization in a highly competitive environment.

In the Markstrat study, view divergence, schema complexity, and integration occurred naturally; that is, without any intervention on the part of the researcher. Therefore, there was no attempt to alter the potential level of interpretation of the group, nor their ability to integrate. In organizations, this opportunity exists. The Markstrat study has suggested that even in a fairly homogeneous group there is cognitive diversity. Therefore, in less homogeneous organizations, the challenge is perhaps one of nurturing diversity rather than having to create it. Furthermore, organizations have the opportunity to complicate the understanding of its members to enhance their schema complexity. One method of complicating schemas is through management education programs. However, many companies are reluctant to spend the time and money to invest in intellectual capital. There are often more pressing requirements for the financial and human resources. An "on the job" method of complicating schemas is through activities such as scenerio planning and strategic planning. When strategic planning is done for the sole purpose of allocating resources, however, there is little opportunity for individual learning. On the other hand, when it is conducted for the purpose of developing strategic thinking, individuals may develop more complicated views about the organization and the environment, and in doing so, develop the shared support and understanding necessary for integration.

An interesting issue organizations face is whether to try and attain some convergence or overlap in schemas across organization members, either by focusing attention on particular aspects of the business, or by attempting to expand or complicate the schemas of organization members to attain overlap. In contrast, rather than attempting to obtain convergence, organizations may choose to preserve diversity through specialization, and focus on developing a process of integrating that enables them to synthesize diversity and take action without obtaining convergence of schemas. In the first case, an organization might pursue activities such as job rotations or promoting from within to give individuals maximum exposure to all facets of the organization; while in the second case, the emphasis is on developing processes for bringing together diverse views. Many organizations are likely to opt for the first approach, since it provides more comfort and certainty for individuals to have some convergence of views. However, and attempt to develop a cadre of generalists is costly, and the organization risks losing its expertise. On the other hand, relying on process takes a tremendous amount of patience and trust to develop a workable system. This dissertation has suggested that the process is important, but achieving integration is the ultimate goal.

However, complicating the understanding of individuals is not simply a task of providing them with more information. Such a view is consistent with the information perspective presented in Chapter II, but inconsistent with the interpretive perspective. It is suggested that the rational and information perspectives have not only captured the attention of management theorists, but they have also captured the attention of managers. Managers continually underestimate the impact of their existing beliefs on their ablity to interpret information. They operate under the assumption that "I will believe it when I see it". The interpretive perspective advocated in this dissertation suggests that managers are more likely to "see it when they believe it". It is suggested that sensitizing managers to the interpretive perspective will be an ongoing challenge for researchers and teachers in the field of management.

In summary, achieving integration while preserving and nurturing diversity is a critical task for organizations. Complicating the understanding of organization members is expected to reduce the requirement for diversity and integration, since individuals themselves develop differentiated and integrated schemas.

LIMITATIONS OF THE STUDY

This section examines the primary limitations of the empirical portion of this dissertation. The Markstrat study was not intended to be an examination of the processes of interpreting and integrating. It was intended to be an examination of the relationships among the product of these processes, cognitive schemas, and performance. It was argued in Chapter IV that whether or not the processes are representative of reality is not at issue, nor a limitation of the potential benefits of the study. The question is whether the relationship between organization schemas and performance which was exemplified by the Markstrat study holds in the real world. It was suggested in Chapter IV that, since the study examined the content of schemas relative to a particular environment (Markstrat), the findings should be generalizable. However, while the study was not intended to examine the processes of interpreting and integrating, it may be that "real-world" processes have an impact on schema content as discussed below. Although previous studies have supported Markstrat as being representative of real world decision-making, no specific examination of the external validity of the relationship in question has been performed.

Although the study was not intended to examine the process of integrating, some insights from the video-tape suggest some limitations of the study. It may be possible that groups with a low level of potential interpretation at the outset may, in fact, enhance their position through a process that initially generates diversity and subsequently integrates it. Future research needs to examine the likelihood that this might occur.

A primary difference between the Markstrat environment and real organizations is the lack of systems and structures found in the informal and temporary organization of most Markstrat groups. While the fact that Markstrat controls for systems and structures was one of the reasons for choosing the simulation, it did not provide for an examination of the impact of systems and structures. As discussed in Chapter I, systems and structures act as store houses of beliefs, and hence provide an added level of complexity when examining organization cognition.

There have been few empirical examinations of cognitive schemas. The approach and several of the measurement techniques developed for this study are novel, and there are no standards with which to compare the levels of divergence, complexity and integration. Although the theory supporting the measure of schema complexity has strong support, the measurement of the construct needs further research.

It is difficult to assess whether the role of time was a limitation of the study. Decisions were made within a set time frame, and it took groups generally two to three hours for each set of decisions made. This factor may have put Contentious groups at a disadvantage. Given more time, they might have been able to resolve their diversity. Or conversely, they might have had more time to argue, which might have contributed to a further deterioration in performance.

In summary, the strength of the study was that it provided a controlled environment which facilitated the elicitation and comparison of schemas, the measurement of performance, and the control of intervening factors. However, trade-offs were made when a controlled environment was chosen. The limitations of the study were largely foreseen, since they represent the by-products of the trade-offs that were made. However, the results must be interpreted in light of the limitations identified. The controlled environment takes the phenomenon out of its natural setting. Although it has been argued that Markstrat is a realistic simulation, real organizations present and face a much more complex environment. The research design for this study was selected for the high level of control it provided while still presenting a realistic environment. However, future research efforts, as discussed below, will be better positioned as a result of this study to address its limitations by reducing the level of control and opening the door to more complexity.

FUTURE RESEARCH AGENDA

Three primary lines of research are identified for a future research agenda. The three lines of research correspond to the agendas of the first three chapters of this dissertation. As depicted in Figure 0.1, this dissertation began with a broad focus on organization learning, narrowing the focus to a sociocognitive model in Chapter II and further narrowing the focus in Chapter III to address the research issue of the relationship between organization schemas and performance.

Beginning with the narrower issue of organization schemas and performance, further research could be done to refine the measures in this study, particularly with respect to the measure of schema complexity. Three weaknesses of the study could be addressed: 1) analyzing the impact of time constraints on the integration of diverse schemas; 2) developing a measure of schema complexity which captures the individuality of the schemas; and 3) examining whether groups with less diversity at the outset are able to create diversity in the process. Although this line of inquiry would be fruitful, it is suggested that the next phase of the research program needs to complicate the model by examining the **processes** of interpreting and integrating. It is expected that through the examination of the processes, greater insight will be gained into the content of individual and organization schemas.

Complicating the organization performance issue by examining process fits with the second line of research addressed by the sociocognitive model in Chapter II. By examining the processes and the content of individual and organization schemas simultaneously, the researcher could examine issues such as the paradox of maintaining diversity during the process of integrating. This is, perhaps, the area in greatest need of future research. There is very little understanding of how schemas are integrated. For example, is it desirable to have an organization schema where individual schemas have considerable overlap as suggested by Ouchi's (1980) "clan-like" organizations and this dissertation's concept of "groupthink schema", or one where diversity is nurtured at the risk having a "contentious schema"?

As well, issues arising from this study regarding the relationship between favourable and unfavourable environments and types of organization schema could be examined. For example, does an unfavourable environment create its own frame-breaking diversity, thereby reducing the need for diversity and increasing the need for integration?

In presenting this research to a variety of audiences, individuals frequently use the typology to label companies. It would be extremely useful to develop rich descriptions of organizations which resemble each of the four organization schemas with a view to developing greater insight into the components of the model. Future research efforts could relax the controls in this study, and move into the field with a focus on developing rich descriptions about the constructs in Figure 2.1, and their inter-relationships.

A third line of future research would build on the theory of organization learning presented in Chapter I. There are several issues that need to be addressed if researchers are to develop a better understanding of organization learning. For example, do organizations experience different types of learning as depicted in Figure 1.1? What is the relationship between cognitive change and behavioral change? What is the role of time in the learning process? What factors contribute to more effective learning in organizations? Can organizations learn how to learn? The Markstrat simulation revealed that many groups were adept at identifying their mistakes, but very few groups took the time to identify why and how they occurred.

In summary, this dissertation was intended to develop a foundation for further research on organization learning and cognition as they relate to strategic management. The field of organization learning and cognition, with its associated methodologies, is in its infancy, hence, it is natural to have more issues ahead of us than behind us. It is hopeful that as the field grows it will develop a strong root system. This dissertation has attempted to help cultivate that root system through the development of both theory and methodology, and through theory testing in a controlled environment. Future research will benefit from continuing to develop the root system with respect to theoretical and methodological developments and will hopefully gain greater insight into organization learning and cognition by relaxing the controls of this study to deal with the complexity of the phenomenon in the field.

CONCLUSIONS

In conclusion, this study has aided in the development of a theoretical and methodological foundation for the study of organization learning and cognition. The concept of organization learning presented in Chapter I and its associated precepts provide a broader view of organization learning than has been presented. Since individual learning was identified as an integral part of organization learning, the dissertation introduced theories and concepts of individual learning that form the necessary underpinnings for understanding individual learning in organizations. However, it was stated that organization learning is more than the simple sum of individual learning: the process of integrating, and non-human store houses of beliefs and knowledge, such as systems and structures, are additional elements of organization learning. Rather than trying to separate cognition and behavior as has been the practice by most theorists, this dissertation has suggested that the most interesting issues are to be found in the interface between the two, and therefore a concept of organization learning must encompass both. The process of organization learning was characterized by a dynamic interplay among organization belief systems (individual beliefs, and systems and structures), the behavior of organization members, and stimuli from the environment, where organization beliefs act as inputs to the process to guide what is interpreted, yet are also outputs or products as they are modified in the process.

The precepts of organization learning were captured in the sociocognitive model of strategic management presented in Chapter II. The model extends conventional notions of strategic management to incorporate elements of cognition that provide insight into how organizations interpret their environment. The model encompasses: individual aspects of learning (individual schemas, process of interpreting); organizational aspects of learning (organization schema, process of integrating); cognitive products of the learning process (individual schemas, organization schemas);and, behavioral products (process of interpreting, process of integrating, actions). The model is depicted as a dynamic interplay among the cognitive and behavioral elements and the stimuli from the environment.

Individual and organization schemas are the cognitive elements that both guide the processes of interpreting and integrating, and are modified in the process. Since they have received little attention from management researchers, yet have the potential to provide great insight into strategic management issues, they were targeted for further development in Chapter III. A typology of organization schemas was presented based on the dimensions of level of interpretation and integration. Level of interpretation was viewed as the potential which exists in a group to interpret stimuli from the environment, based on the group's level of diversity and schema complexity. Integration, however, was considered essential in order to realize the potential arising from the cognitive diversity. The model was applied to an issue that has been debated in the Strategic Management literature for over a decade: whether consensus on goals and/or means leads to better performance. Applying the model to the consensus performance issue demonstrated how a cognitive perspective can shed light on issues in strategic management, since it indicated that the traditional view of consensus did not distinguish among Impoverished, Groupthink, and Productive schemas.

While the intention of this dissertation was to aid in the development of the theoretical foundation of the study of organization learning and cognition, it was also the intention to aid in the development of methodology. The Markstrat simulation was chosen as a vehicle to test the research model because of its high level of control, which enhanced internal reliability, and its realistic nature, which enhanced external validity. A technique for measuring cause maps to be administered and compared across the 398 respondents in the study was developed, as were scales to measure view divergence and level of integration. Multiple measures were used wherever possible. The techniques were extensively pre-tested and a pilot study was conducted to test the research model. The interactive Markstrat simulation was conducted over a one week period, during which over 100 hours of video-tape of the discussions of five groups were taken to gain greater insight into the process. Three questionnaires were administered as part of the study: two of these captured cause maps, one at the beginning and one at the end of the simulation.

Overall, the results of the study provided strong support for the hypotheses. Level of integration was found to be a significant predictor of performance, since Productive and Groupthink groups outperformed Contentious and Impoverished groups. As well, integration was found to moderate the relationship between interpretation and performance, such that groups with high interpretation only performed well if they also had high integration. Therefore Productive groups outperformed Contentious groups, who had the lowest performance of all schema types. As well, the results indicated the difficulty of achieving integration given a high level of initial diversity, since there were significantly fewer Productive groups than Contentious groups, and significantly more Groupthink groups than Impoverished groups. Therefore, the results indicate that not only is it difficult to integrate a high level of diversity, but failing to do so is disastrous, as was found in the performance of Contentious groups. The results, however, were disappointing with respect to the measure of schema complexity. The fixed-form approach to schema elicitation, provided a good basis to compare schemas, hence improving the view divergence measure; but is also limited the number of constructs respondents could use in the cause map, hence minimizing the variability in the measure of schema complexity. Overall however, the results indicate that the cause maps proved to be a powerful tool to examine the relationship between cognitive diversity and performance.

As well, the study provided greater insight into the consensus-performance issue. In previous research, consensus has been measured as the degree of correspondence in a group's ratings of key success factors. This measurement is similar to the measure of view divergence on rank used in this study. From a cognitive perspective, the integrating of schemas is different than the measure of view divergence, as was found in this study. While view divergence is a predictor of performance, it works in the opposite direction from that suggested by the previous consensus performance literature. High view divergence is valued as an **input** into the process. However, this study suggested that integration is critical and difficult to achieve for groups with high view divergence. Furthermore, integration is different than the concept of consensus conceputalized in consensus performance research. In this study, the level of integration was predictive of performance, not level of correspondence, or final view divergence, as has been the measure in previous research. Essentially, previous research on consensus and performance, has not distinguished among Impoverished, Groupthink and Productive schemas. For example, if the degree of consensus is measured at the beginning of the decision making process, a high degree of consensus (low view divergence) may in fact be an Impoverished schema. Conversely, a low degree of consensus (high view divergence) early on, followed by a high degree of integration will lead to a Productive schema. The findings from this study indicate that groups with Impoverished schemas have significantly lower performance than groups with Groupthink and Productive schemas.

From a management perspective, understanding the nature of organization schemas as they relate to view divergence, complexity and integration is essential, particularly as companies grapple with the difficulties of integrating the diverse perspectives arising from globalization. Furthermore, effectively interpreting critical environmental cues in a rapidly changing environment is a key component of learning. As DeGeus (1988) points out, the only competitive advantage for the future will be an organization's ability to learn faster than its competitors.

It is expected that this study will provide researchers with a point of departure to examine how schemas affect strategic decision making. It has been suggested that deficiencies in managerial beliefs about cause and effect (cognitive schemas) have been instrumental in organization failure and crises (Ford & Hegarty, 1984; Hall, 1984). This research takes a preliminary look at some possible cognitive deficiencies and sets the stage for further research on organization learning and cognition. As Sims, Gioia and Associates point out: "we have arrived at a point where the picture of organization action must be extended. To do so requires a deeper probing into the nature of organization cognition" (1986; p. 3).

APPENDIX 4A - FIRST QUESTIONNAIRE

The UNIVERSITY of WESTERN ONTARIO
School of Business Administration

Dear Participant:

Re: Research on Strategic Decision Making

The attached folder contains two exercises that are part of a research project on strategic decision making in top management teams. Your participation in the simulation game MARKSTRAT will be used to gain insight into group decision making. These two exercises will be followed by two brief questionnaires that you will receive during MARKSTRAT. In this research, there is no "right" answer. The tasks are designed to capture your individual thoughts/perceptions.

Since this research focuses on group composition and processes, your individual response is critical to develop a complete understanding of the group. Missing information from one individual will invalidate the responses for the whole group. Please supply all the requested information.

For the purpose of identifying the group and understanding inter-relationships, it is necessary that you include your name on the response forms. However, your responses are completely confidential. Each person's data will be assigned a coded number and the list of names corresponding to codes will be locked up and available only to me.

As a participant in this research, you will be helping to break new ground in the field of management. The results of the study will be communicated to you as soon as they are available. Thank you for participating in what is anticipated to be exciting and promising research.

Sincerely,

M Crossan

Mary Crossan

Participant's Name____________________

Research on Strategic Decision Making

YOUR ROLE

This folder contains two exercises which are based on the same environment you will face in MARKSTRAT. For the following two exercises assume that you are the General Manager of a company with sales of $200 million. You manufacture and market several brands of a consumer durable good, comparable to an electronic entertainment product. Your market has a population of approximately 250 million, and there are four other competitors in your industry with approximately equal market share.

Your market has grown significantly over the last twenty years. After several significant breakthroughs, the products have increasingly appealed to a wider audience. However, in contrast with what has occurred in the last twenty years, no major basic technological changes are expected in the future. It is generally thought that the firms in your industry will modify their brands and introduce new ones in the coming years in order to better meet the needs of the market segments. It is now a well structured market with five significant competitors and established channels of distribution (specialty stores, department stores, electric appliance stores).

More recently, there has been talk in the industry about a completely new product. The idea for the product comes from a basic technological breakthrough made in the space industry under government contracts. Your industry is the one most likely to manufacture and distribute the new product because of your technical and marketing expertise.

The University of Western Ontario

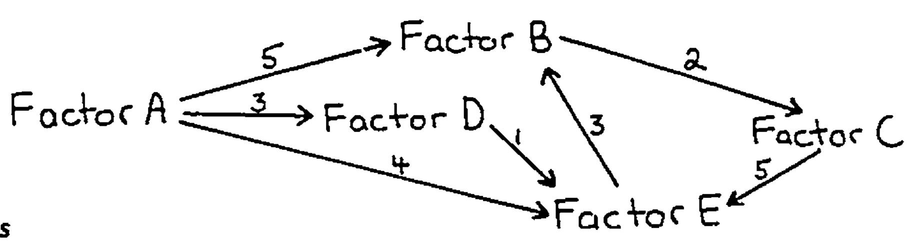
School of Business Administration
London, Ontario
N6A 3K7
Mary Crossan

STEP A

EXERCISE I

The purpose of this step is to draw a diagram, similar to the sample diagram, that identifies your understanding of the relationships between several factors. Please draw your diagram on the opposite page, following the guidelines outlined below.

Sample Diagram



Guidelines

1. Factors must be *selected from those suggested in Table 1* (below). Include only those factors that you feel affect the success of your organization.
2. Your diagram should only include a *one-directional arrow* between any two factors, capturing the direction of the relationship which you believe is the strongest. In some instances you may believe that a change in Factor A causes a change in Factor B and vice versa, however you must decide whether A causing B is stronger than B causing A.
3. An arrow indicates that a change in one factor *causes a change* in another. The change may be *quantititative* (eg., increase/decrease) or *qualitative* (eg., change in attributes/type).
4. Only indicate the *direct* relationships between factors. For example, in the sample diagram, A directly affects B, D and E. Although A *indirectly* affects C through B, there is no direct arrow between A and C. However, note that A has both a direct and indirect relationship with E through D.
5. Each factor may affect and/or be *affected by more than one factor*, as illustrated by Factor A and E.
6. Each factor used should only appear *once* on the diagram.

You may use the *italicized abbreviations* in Table 1 to identify the factors. Your diagram need not be as neat as the sample diagram. However, it should be neat enough to enable the researcher to clearly identify the factors and their relationships.

Table 1 - Factors

***Adv*ertising**	***Price* of Product**
Company *Funds* Availability	**Product *Avail*ability**
***Comp*etitor Actions**	***Product* Characteristics**
Consumer *Aware*ness of Product	**Production *Volume***
***Costs* (fixed & variable)**	***Profits***
***Dist*ribution**	**Purchase *Intent*ions of Consumer**
Market *Research*	**Research and Development *(R&D)***
Market *Share* (%)	***Sales***
Market *Size*	**Size of Sales *Force***

STEP B

On the diagram you have drawn, indicate the strength of the relationship between each pair of factors using the scale below. Insert the appropriate number on the line joining the two factors, as shown in the sample diagram. Please be sure that you have placed a number on each relationship.

Very Weak	Weak	Moderate	Strong	Very Strong
1	2	3	4	5

(the original booklet included a blank page opposite the instruction page for drawing the cause map)

EXERCISE II

Managers spend varying amounts of time attending to different factors, according to how much knowledge and/or manipulation of these factors can influence the success of the organization. By ranking the factors in Table 2 below, indicate how you would focus your energy and attention, with a "1" indicating a factor that warrants the greatest attention and an "18" indicating the factor that warrants the least attention. All of the items must be included in your ranking, even those you did not include in the previous exercise. No two items should receive the same ranking.

Table 2

FACTORS	*RANK ORDER*
ADVERTISING	______
COMPANY FUNDS AVAILABILITY	______
COMPETITOR ACTIONS	______
CONSUMER AWARENESS OF PRODUCT	______
COSTS	______
DISTRIBUTION	______
MARKET RESEARCH	______
MARKET SHARE (%)	______
MARKET SIZE	______
PRICE OF PRODUCT	______
PRODUCT AVAILABILITY	______
PRODUCT CHARACTERISTICS	______
PRODUCTION VOLUME	______
PROFITS	______
PURCHASE INTENTIONS OF CONSUMER	______
RESEARCH & DEVELOPMENT	______
SALES	______
SIZE OF SALES FORCE	______

APPENDIX 4B - SECOND QUESTIONNAIRE

PARTICIPANT'S NAME ____________________

GROUP NUMBER __________

Research on Strategic Decision Making

Dear Participant:

Thank you for the time and effort you put into the previous questionnaire. As I have conveyed to many of you, I have been very impressed by the thought and attention you have given to this study. Your involvement in the process is critical, and I sincerely appreciate your efforts.

The following questionnaire is the first of two questionnaires that you will receive during MARKSTRAT. As with the previous questionnaire, your responses are **completely confidential** and will in no way affect your grade or the grade of anyone else in this course. Although your Professor will distribute and collect the questionnaires, they will be forwarded directly to me in sealed envelopes.

In completing this questionnaire, **please do not consult your colleagues or the Markstrat material** that you have been given. The purpose of the questionnaire is to capture your unique, individual perspective relating to your experience during MARKSTRAT.

Since this study focuses on the role of individuals in group decision making, your individual response is critical to obtaining a complete understanding of the group. Missing information will invalidate the responses for the whole group. As with the previous questionnaire, your name is required for the purpose of carrying out analysis on the group.

Please seal your questionnaire in the envelope provided, and submit it to your Professor with your next decision input.

Thank you for your time and effort.

Sincerely,

M. Crossan

Mary Crossan

The University of Western Ontario

School of Business Administration
London, Ontario
N6A 3K7

Please complete the following chart by responding to the questions below.

CHART A

GROUP MEMBER (Surname, Initial)	Question 1 DEGREE INVOLVED	Question 2a DEGREE INFLUENCED ME	Question 2b DEGREE INFLUENCED GROUP	Question 3a DEGREE SHARED MY VIEWS (beginning)	Question 3b DEGREE SHARES MY VIEWS (now)
1) (SELF)	____	N/A	____	5	5
2) ____	____	____	____	____	____
3) ____	____	____	____	____	____
4) ____	____	____	____	____	____
5) ____	____	____	____	____	____
6) ____	____	____	____	____	____
7) ____	____	____	____	____	____

1. On Chart A, please indicate the degree to which each member of your group, including yourself, have been involved in the decision making process. Involvement includes active discussion, attentive listening and independent analysis.

Very Low Involvement	*Low Involvement*	*Medium Involvement*	*High Involvement*	*Very High Involvement*
1	*2*	*3*	*4*	*5*

2. On Chart A, please indicate the degree to which each member of the group has: a) influenced you; and b) influenced the group during the simulation. Include a rating for yourself for question 2b. Influence refers to the degree to which someone has affected your thinking about decisions made in the simulation.

Very Low Influence	*Low Influence*	*Medium Influence*	*High Influence*	*Very High Influence*
1	*2*	*3*	*4*	*5*

3. On Chart A, please indicate the degree to which each member of the group shared your views about the factors or course of action that would lead to success for your MARKSTRAT organization. Please rate the degree of agreement: a) at the beginning of the simulation; and b) at this point in the simulation.

Shared None Of My Views	*Shared Some Of My Views*	*Shared Many Of My Views*	*Shared Most Of My Views*	*Shared All Of My Views*
1	*2*	*3*	*4*	*5*

Reflecting on the decisions you made during MARKSTRAT, please respond to the questions below by circling the appropriate response.

	1 Strongly Disagree	2 Moderately Disagree	3 Slightly Disagree	4 Neither Agree Nor Disagree	5 Slightly Agree	6 Moderately Agree	7 Strongly Agree
			(circle your response)				
4. So far, we have set cost reduction of products as a priority	1	2	3	4	5	6	7
5. Our group discussions have been quite productive.	1	2	3	4	5	6	7
6. We have been able to predict the significant trends	1	2	3	4	5	6	7
7. My group has been very interested in the simulation	1	2	3	4	5	6	7
8. We generally have not sacrificed profitability to gain market share	1	2	3	4	5	6	7
9. Market research has provided valuable input to decision making	1	2	3	4	5	6	7
10. So far, I have not supported most of the major decisions made by my group	1	2	3	4	5	6	7
11. Decisions about one product were made independently of decisions about other products	1	2	3	4	5	6	7
12. In my opinion, Markstrat emphasizes the importance of accurate market segmentation and focused product positioning	1	2	3	4	5	6	7
13. Our criteria for resource allocation have generally reflected short-term considerations	1	2	3	4	5	6	7
14. Frankly, we are discouraged by our performance so far	1	2	3	4	5	6	7
15. We have constantly sought new opportunities.	1	2	3	4	5	6	7
16. I find that I have become very involved in the simulation	1	2	3	4	5	6	7
17. We have frequently cut prices to increase market share	1	2	3	4	5	6	7
18. Our group members listened carefully to each others' ideas.	1	2	3	4	5	6	7
19. When making decisions, we took into account all of the organization's functional areas (i.e. Finance, Production, Marketing, Human Resources, etc.)	1	2	3	4	5	6	7
20. I have often found myself in opposition to the decisions made by my group	1	2	3	4	5	6	7
21. We have aggressively sought a market share position even at the expense of cash flow and profitability.	1	2	3	4	5	6	7
22. I have found that Markstrat emphasizes the use of market research to anticipate customer needs	1	2	3	4	5	6	7
23. In my opinion, we have made the most of each group member's skills & abilities.	1	2	3	4	5	6	7
24. We were usually the first ones to introduce new brands or products into the market	1	2	3	4	5	6	7
25. I feel that my group has been too easily distracted from the simulation.	1	2	3	4	5	6	7
26. We usually carried out "what-if" analysis of critical issues	1	2	3	4	5	6	7
27. We are excited about our prospects for the future	1	2	3	4	5	6	7
28. We eliminated products in the later stages of their life cycle.	1	2	3	4	5	6	7

	1 Strongly Disagree	2 Moderately Disagree	3 Slightly Disagree	4 Neither Agree Nor Disagree	5 Slightly Agree	6 Moderately Agree	7 Strongly Agree
			(circle your response)				
29. I have found that Markstrat demonstrates the value and limitations of advertising.	1	2	3	4	5	6	7
30. We adopted a "conservative" view to decision making, avoiding unnecessary risks whenever possible	1	2	3	4	5	6	7
31. I definitely concur with the major decisions made by my group	1	2	3	4	5	6	7
32. We conducted a very thorough analysis of factors affecting major decisions.	1	2	3	4	5	6	7
33. I must admit that much of the time I have not been very interested in the simulation	1	2	3	4	5	6	7
34. We have often set prices below the competition.	1	2	3	4	5	6	7
35. Our group has had difficulty integrating everyone's perspective	1	2	3	4	5	6	7
36. Products having more certain returns were definitely favoured	1	2	3	4	5	6	7
37. The group has been very focused on the simulation	1	2	3	4	5	6	7
38. Our decisions have often reflected a "gut-feel" assessment rather than a lengthy analysis of all available data	1	2	3	4	5	6	7
39. One of our problems has been that members of the group do not cooperate	1	2	3	4	5	6	7
40. Our operations could be characterized as high-risk	1	2	3	4	5	6	7
41. Our group has developed an effective synthesis of all viewpoints	1	2	3	4	5	6	7
42. Our R & D efforts have been focused on cost reduction ..	1	2	3	4	5	6	7
43. I have found that Markstrat is a realistic simulation of competitive market forces	1	2	3	4	5	6	7
44. I understand the rationale for the major decisions made by my group	1	2	3	4	5	6	7
45. In our group, decision-making has often been dominated by a few individuals	1	2	3	4	5	6	7
46. Our group has put its best effort into the simulation	1	2	3	4	5	6	7
47. We have emphasized basic research to provide us with a future competitive edge	1	2	3	4	5	6	7
One of our main objectives has been to maximize:							
48. Rate of sales growth	1	2	3	4	5	6	7
49. Net profit in the short term.	1	2	3	4	5	6	7
50. Net profit in the long term.	1	2	3	4	5	6	7
51. Innovation (new product development)	1	2	3	4	5	6	7
52. Market Share	1	2	3	4	5	6	7

53. The MARKSTRAT experience has had the following effect on me (please circle as many as apply)

a. gave me new insights into the elements of Marketing strategy
b. taught me new analytical skills and techniques
c. reinforced what I already new
d. no effect ·
e. left me more bewildered than when I started

APPENDIX 4C - THIRD OUESTIONNAIRE

PARTICIPANT'S NAME ____________________

GROUP NUMBER ________

Research on Strategic Decision Making

Dear Participant:

The following questionnaire is the final questionnaire in this study. As with the previous questionnaires, your responses are **completely confidential** and will in no way affect your grade or the grade of anyone else in this course. Although your Professor will distribute and collect the questionnaires, they will be forwarded directly to me in sealed envelopes.

Please do not consult your colleagues or the MARKSTRAT materials, in completing the questionnaire. The purpose of the questionnaire is to capture your unique, individual perspective.

Since this study focuses on group decision making, your individual response is critical to obtaining a complete understanding of the whole group. Missing information will invalidate the responses for the group.

Please seal your questionnaire in the envelope provided, and **submit it to your professor with your final decision input.**

Thank you for your time and effort in participating in this study.

Sincerely,

M Crossan

Mary Crossan

The University of Western Ontario

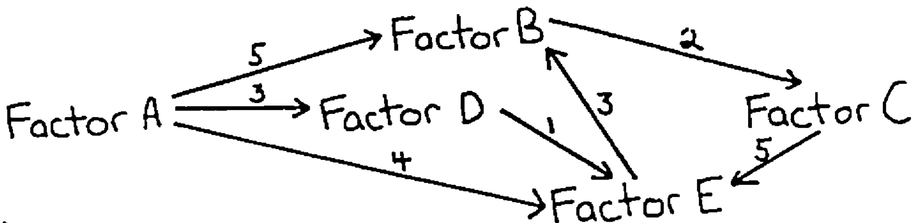
School of Business Administration
London, Ontario
N6A 3K7
Mary Crossan

EXERCISE I

STEP A

The purpose of this section is to draw a diagram, as you did in the first questionnaire, that identifies your understanding of the relationships between the factors listed in Table 1, given your experience in MARKSTRAT. **Please do not consult your colleagues or the MARKSTRAT materials in completing this questionnaire.** Essentially, your diagram should reflect your unique view of the MARKSTRAT world, arising from your group's experience within your industry.

Sample Diagram



Guidelines

1. Factors must be *selected from those suggested in Table 1* (below). Include only those factors that you feel affect the success of your organization.
2. Your diagram should only include a *one-directional arrow* between any two factors, capturing the direction of the relationship which you believe is the strongest. In some instances you may believe that a change in Factor A causes a change in Factor B and vice versa, however you must decide whether A causing B is stronger than B causing A.
3. An arrow indicates that a change in one factor *causes a change* in another. The change may be *quantititative* (eg., increase/decrease) or *qualitative* (eg., change in attributes/type).
4. Only indicate the *direct* relationships between factors. For example, in the sample diagram, A directly affects B, D and E. Although A *indirectly* affects C through B, there is no direct arrow between A and C. However, note that A has both a direct and indirect relationship with E through D.
5. Each factor may affect and/or be *affected by more than one factor*, as illustrated by Factor A and E.
6. Each factor used should only appear once on the diagram.
7. You may use the *italicized abbreviations* in Table 1 to identify the factors. Your diagram need not be as neat as the sample diagram. However, it should be neat enough to enable the researcher to clearly identify the factors and their relationships.

Table 1 - Factors

_Adv_ertising
Company _Funds_ Availability
_Compet_itor Actions
Consumer _Aware_ness of Product
Costs (fixed & variable)
_Dist_ribution
Market _Research_
Market _Share_ (%)
Market _Size_
Price of Product
Product _Avail_ability
Product Characteristics
Production _Volume_
Profits
Purchase _Intent_ions of Consumer
Research and Development _(R&D)_
Sales
Size of Sales _Force_

STEP B

On the diagram you have drawn, indicate the strength of the relationship between each pair of factors using the scale below. Insert the appropriate number on the line joining the two factors, as shown in the sample diagram. Please be sure that you have placed a number on each relationship.

Very Weak	Weak	Moderate	Strong	Very Strong
1	2	3	4	5

(the original booklet included a blank page opposite the instruction page for drawing the cause map)

EXERCISE II

Given the nature of the MARKSTRAT environment - as you have experienced it, rank order the factors in Table 2 according to your belief about how much knowledge and/or manipulation of the factor contributes to the success of your firm. Your ranking of the factors should indicate how you feel you should focus your energy and attention, with a "1" indicating a factor that warrants the greatest attention and an "18" indicating the factor that warrants the least attention. All of the items must be included in your ranking, even those you did not include in the previous exercise. No two items should receive the same ranking.

Table 2

FACTORS	*RANK ORDER*
ADVERTISING	______
COMPANY FUNDS AVAILABILITY	______
COMPETITOR ACTIONS	______
CONSUMER AWARENESS OF PRODUCT	______
COSTS	______
DISTRIBUTION	______
MARKET RESEARCH	______
MARKET SHARE (%)	______
MARKET SIZE	______
PRICE OF PRODUCT	______
PRODUCT AVAILABILITY	______
PRODUCT CHARACTERISTICS	______
PRODUCTION VOLUME	______
PROFITS	______
PURCHASE INTENTIONS OF CONSUMER	______
RESEARCH & DEVELOPMENT	______
SALES	______
SIZE OF SALES FORCE	______

Please ensure that your name and group number are recorded on the front of this questionnaire. As well, please check to make sure you are not missing any information, particularly with respect to the numbers on the arrows, which give the strength of the relationship between factors on your diagram.

APPENDIX 4D - PILOT QUESTIONNAIRE

QUESTIONNAIRE

GROUP # ___ NAME ______________

Please complete the following questionnaire and return it to the instructor. Please be as candid as possible about your responses. This questionnaire is completely confidential and will in no way affect your grade or the grade of anyone else in this course. Please do no consult any of the subartic survival materials, nor any of your class mates in completing this questionnaire. There are no "right" answers. The questionnaire is designed to capture your candid responses.

1. Please rank the items from the subartic survival exercise according to their importance to your survival, starting with "1" as the most important, to "15" as the least important. The ranking should reflect your beliefs at this point in time, which may or may not reflect the ranking you initially made as an individual, or the ranking you decided on as a group.

ITEMS	RANK
Book Entitled, Northern Star Navigation	14
1 Aircraft Inner Tube	13
Hand Ax	4
Wind-Up Alarm Clock	15
Safety Razor Shaving Kit with Mirror	2
750 ml of Bacardi Rum	10
3 Pairs of Snowshoes	12
1 Operating 4 Battery Flashlight	8
75m of Rope	6
13 Wooden Matches	1
7m X 7m Piece of Heavy Duty Canvas	5
Bottle of Water Purification Tablets	9
1 Sleeping Bag Per Person	7
4 Litre Can of Maple Syrup	11
Magnetic Compass	3

2. Consider your ranking from question 1. Please circle the number that indicates how similar/different it is from the ranking that you initially made.

Totally Different	*Very Different*	*Some Similarities & Some Differences*	*Very Similar*	*Totally Similar*
1	*2*	*3*	*4*	*5*

3. Please circle the number which indicates the extent to which other members in the group influenced any changes in your rankings.

No Influence	*Low Influence*	*Medium Influence*	*High Influence*
1	*2* ⟷	*3*	*4*

4. Using the following scale, please indicate on Chart A (below), the degree to which each of your group members shared your views about the importance of the items in the subartic survival simulation: a) at the beginning of the group discussion; and b) at the end of the group discussion.

Shared None Of My Views	*Shared Some Of My Views*	*Shared Many Of My Views*	*Shared Most Of My Views*	*Shared All Of My Views*
1	2	3	a) 4 b)	5

5. On Chart A, please allocate 100 points amongst the members in your group according to the degree to which they influenced you in the group process. Influence refers to the degree to which they affected your thinking about the importance of the items.

6. On Chart A, please allocate 100 points amongst the members in your group, including yourself, according to the degree of influence each member had on the decisions made by your group.

7. On Chart A, please allocate 100 points amongst the members in your group according to the degree to which they were involved in the decision making process. Involvement includes both active discussion and attentive listening.

CHART A

Question	4a	4b	5	6	7
GROUP MEMBER (Surname, Initial)	**SHARED MY VIEWS (beginning)**	**SHARED MY VIEWS (end)**	**INFLUENCED ME (points)**	**INFLUENCED GROUP (points)**	**INVOLVED (points)**
(SELF)	5	5			
1) Chris	4	3	0	15	20
2) Donna	5	5	30	30	30
3) Anthea	3	2	15	7.5	7.5
4) Stacey	3	3	20	20	15
5) John	3	4	20	20	20
6) Angela	2	3	15	7.5	7.5
7)					
TOTAL POINTS	—	—	100	100	100

For the remaining questions, please circle the number below the scale which corresponds with your response.

8. To what degree do you agree/disagree with the decisions made by your group?

Disagreed With All Decisions	Disagreed With Most Decisions	Disagreed With Some/ Agreed With Some Decisions	Agreed With Most Decisions	Agreed With All Decisions
1	2	3	4	5

9. To what degree did you support/oppose the decisions made by your group?

Strongly Opposed	Opposed	Neutral	Supported	Strongly Supported
1	2	3	4	5

10. To what degree do you understand the decisions made by your group?

No Understanding	Some Understanding	Understood Most Decisions	Total Understanding
1	2	3	4

11. How interested were you in the simulation?

Not Interested	Somewhat Interested	Very Interested	Totally Interested
1	2	3	4

12. How involved (active discussion and/or attentive listening) were you in the decision making process?

Not Involved	Somewhat Involved	Very Involved	Totally Involved
1	2	3	4

13. In general, how interested were members of your group in the simulation?

No One Was Interested	Most Were Not Interested	Some Were And Some Were Not Interested	Most Were Interested	Everyone Was Interested
1	2	3	4	5

14. In general, how involved (active discussion and/or attentive listening) were members of your group in the decision making process?

No One Was Involved	Most Were Not Involved	Some Were And Some Were Not Involved	Most Were Involved	Everyone Was Involved
1	2	3	4	5

15. How would you characterize your group discussions?

a)

Extremely Unproductive	Very Unproductive	Unproductive	Productive	Very Productive	Extremely Productive
1	2	3	4	5	6

b)

Extremely Cooperative	Very Cooperative	Cooperative	Uncooperative	Very Uncooperative	Extremely Uncooperative
1	2	3	4	5	6

c)

Extremely Supportive	Very Supportive	Supportive	Unsupportive	Very Unsupportive	Extremely Unsupportive
1	2	3	4	5	6

d)

Extremely Rational/ Logical	Very Rational/ Logical	Rational/ Logical	Irrational	Very Irrational	Extremely Irrational
1	2	3	4	5	6

e)

Extremely Active/ Lively	Very Active/ Lively	Active/Lively	Passive/Quiet	Very Passive/ Quiet	Extremely Passive/ Quiet
1	2	3	4	5	6

f)

Extremely Unemotional	Very Unemotional	Unemotional	Emotional	Very Emotional	Extremely Emotional
1	2	3	4	5	6

g)

Extremely Unenjoyable	Very Unenjoyable	Unenjoyable	Enjoyable	Very Enjoyable	Extremely Enjoyable
1	2	3	4	5	6

h)

Extremely Interesting	Very Interesting	Interesting	Uninteresting	Very Uninteresting	Extremely Uninteresting
1	2	3	4	5	6

i)

Extremely Hostile	Very Hostile	Hostile	Friendly	Very Friendly	Extremely Friendly
1	2	3	4	5	6

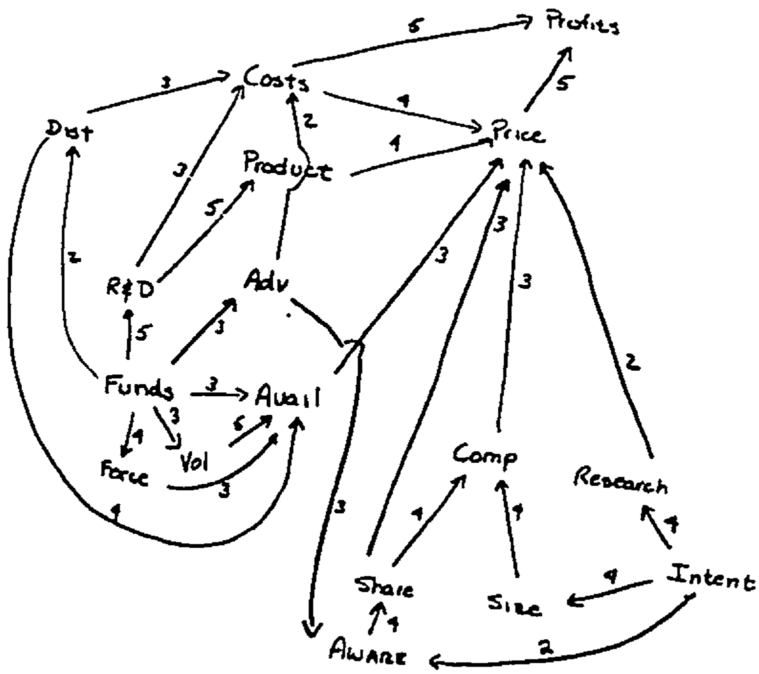
FOLLOW-UP QUESTIONNAIRE

In order to obtain your feedback on the previous questionnaire, please indicate any questions to which you found it difficult to respond. Please be as specific as possible, and indicate what it was about the question that made it difficult. If you have any other comments about the questionnaire, please include them.

I found the first extremely confusing. Sorry about the mess, maybe I'm just a bit slow today because of [illegible] week. I also found it hard to do.

APPENDIX 4E - EXAMPLES OF CAUSE MAPS

GRADUATE STUDENT - MBA
CAUSE MAP FROM
MARKSTRAT SIMULATION



COMPANY FUNDS AVAILABLE

↓ 4

COST OF PRODUCT

↓ 5

PRICE OF PRODUCT

↓ 1

ADVERTISING

↓ 1

PRODUCT CHARACTERISTICS

↓ 5

CONSUMER AWARENESS OF PRODUCT

↓ 3

PURCHASE INTENTIONS OF CONSUMER $\xrightarrow{4}$ SALES $\xrightarrow{4}$ MARKET SHARE

↓ 4

NACKET SIZE

FIRST YEAR
BUSINESS STUDENT

APPENDIX 5A - VIEW DIVERGENCE & SCHEMA COMPLEXITY: FAVOURED & UNFAVOURED GROUPS

This appendix presents the results of the analysis of: 1) view divergence by integration; and 2) schema complexity by integration; for: a) the 28 groups beginning in a favourable start position; and b) the 42 groups beginning in an unfavourable start position. For each of the four conditions, three tables of results arc presented. The first table presents the mean performance as measured by the cumulative net marketing contribution in millions of dollars (cnmc), and the frequency of groups in each cell of the two by two matrix. The second table presents the results of a two way analysis of variance, while the third table presents the results of specific contrasts between each of the four cells in the two by two matrix.

TABLE 5A.1 VIEW DIVERGENCE BY INTEGRATION (FAVOURED GROUPS): Means & Freq

INTEGRATION	VIEW DIVERGENCE: LOW	VIEW DIVERGENCE: HIGH	TOTAL
LOW	CELL 1 $\bar{X}$ CNMC = \$706.2 (Groups = 6)	CELL 2 $\bar{X}$ CNMC = \$443.2 (Groups = 4)	$\bar{X}$ CNMC = \$601.0 (Groups = 10)
HIGH	CELL 3 $\bar{X}$ CNMC = \$727.1 (Groups = 12)	CELL 4 $\bar{X}$ CNMC = \$874.6 (Groups = 6)	$\bar{X}$ CNMC = \$776.3 (Groups = 18)
TOTAL	$\bar{X}$ CNMC = \$720.1 (Groups = 18)	$\bar{X}$ CNMC = \$702. (Groups = 10)	$\bar{\bar{X}}$ = \$713.7 (Groups = 28)

$\bar{X}$ CNMC = Average cumulative net marketing contribution in millions of dollars

TABLE 5A.2 ANOVA : VIEW DIVERGENCE, INTEGRATION & PERF. (FAVOURED GPS)

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F VALUE	SIG. OF F
Main Effects	197845.599	2	98922.799	1.209	.316
Integration	195741.086	1	195741.086	2.392	.135
View Divergence	264.968	1	264.968	.003	.955
2-Way Interaction	252837.218	1	252837.218	3.090	.092**
Explained	450682.816	3	150227.605	1.836	.168
Residual	1963671.941	24	81819.664		
Total	2414354.757	27	89420.547		

** significant at .05

TABLE 5A.3 ANOVA: CELL CONTRASTS - VIEW DIVERGENCE (FAVOURED GPS)

CELL CONTRAST	T VALUE	T PROBABILITY
Cell 1 - Cell 2	1.424	.167
Cell 1 - Cell 3	-.146	.885
Cell 1 - Cell 4	-1.020	.318
Cell 2 - Cell 3	-1.719	.098
Cell 2 - Cell 4	-2.336	.028**
Cell 3 - Cell 4	-1.031	.313

TABLE 5A.4 VIEW DIVERGENCE BY INTEGRATION (UNFAVOURED GPS): Means & Freq

INTEGRATION	VIEW DIVERGENCE: LOW	VIEW DIVERGENCE: HIGH	TOTAL
LOW	CELL 1 $\bar{X}$ CNMC = \$248.5 (Groups = 7)	CELL 2 $\bar{X}$ CNMC = \$191.6 (Groups = 19)	$\bar{X}$ CNMC = \$206.9 (Groups = 26)
HIGH	CELL 3 $\bar{X}$ CNMC = \$406.1 (Groups = 10)	CELL 4 $\bar{X}$ CNMC = \$412.7 (Groups = 6)	$\bar{X}$ CNMC = \$408.6 (Groups = 16)
TOTAL	$\bar{X}$ CNMC = \$341.2 (Groups = 17)	$\bar{X}$ CNMC = \$244.7 (Groups = 25)	$\bar{\bar{X}}$ CNMC = \$283.7 (Groups = 42)

$\bar{X}$ CNMC = Average cumulative net marketing contribution in millions of dollars

TABLE 5A.5 ANOVA : VIEW DIVERGENCE, INTEGRATION & PERF. (UNFAVOURED GPS)

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F VALUE	SIG. OF F
Main Effects	410702.074	2	205351.037	5.175	.010**
Integration	316404.330	1	316404.330	7.973	.008**
View Divergence	7999.340	1	7999.340	.202	.656
2-Way Interaction	8725.795	1	8725.795	.220	.642
Explained	419427.869	3	139809.290	3.523	.024**
Residual	1507953.704	38	39682.992		
Total	1927381.573	41	47009.307		

TABLE 5A.6 ANOVA: CELL CONTRASTS - VIEW DIVERGENCE (UNFAVOURED GPS)

CELL CONTRAST	T VALUE	T PROBABILITY
Cell 1 - Cell 2	.646	.522
Cell 1 - Cell 3	-1.605	.117
Cell 1 - Cell 4	-1.482	.147
Cell 2 - Cell 3	-2.756	.009**
Cell 2 - Cell 4	-2.370	.023**
Cell 3 - Cell 4	-.064	.949

TABLE 5A.7 SCHEMA COMPLEXITY BY INTEGRATION (FAVOURED GPS): Means & Freq

	SCHEMA COMPLEXITY: LOW	SCHEMA COMPLEXITY: HIGH	TOTAL
INTEGRATION: LOW	CELL 1 $\bar{X}$ CNMC = \$659.4 (Groups = 6)	CELL 2 $\bar{X}$ CNMC = \$513.4 (Groups = 4)	$\bar{X}$ CNMC = \$601.0 (Groups = 10)
INTEGRATION: HIGH	CELL 3 $\bar{X}$ CNMC = \$695.8 (Groups = 9)	CELL 4 $\bar{X}$ CNMC = \$856.7 (Groups = 9)	$\bar{X}$ CNMC = \$776.3 (Groups = 18)
TOTAL	$\bar{X}$ CNMC = \$681.2 (Groups = 15)	$\bar{X}$ CNMC = \$751.8 (Groups = 13)	$\bar{\bar{X}}$ = \$713.8 (Groups = 28)

• $\bar{X}$ CNMC = Mean cumulative net marketing contribution in millions of dollars

TABLE 5A.8 ANOVA :SCHEMA COMPLEXITY, INTEGRATION & PERF.- FAVOURED GPS

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F VALUE	SIG. OF F
Main Effects	217827.590	2	108913.795	1.276	.298
Integration	183846.438	1	183846.438	2.153	.155
Schema Complexity	20246.958	1	20246.958	.237	.631
2-Way Interaction	147437.429	1	147437.429	1.727	.201
Explained	365265.019	3	121755.006	1.426	.260
Residual	2049089.739	24	85378.739		
Total	2414354.757	27	89420.547		

TABLE 5A.9 ANOVA: CELL CONTRASTS - SCHEMA COMPLEXITY (FAVOURED GPS)

CELL CONTRAST	T VALUE	T PROBABILITY
Cell 1 - Cell 2	.774	.446
Cell 1 - Ceil 3	-.236	.815
Cell 1 - Cell 4	-1.281	.212
Cell 2 - Cell 3	-1.039	.309
Cell 2 - Cell 4	-1.955	.062**
Cell 3 - Cell 4	-1.168	.254

TABLE 5A.10 SCHEMA COMPLEXITY BY INTEGRATION-UNFAVOURED GPS:Means & Freq

SCHEMA COMPLEXITY

INTEGRATION	LOW	HIGH	TOTAL
LOW	CELL 1 X̄ CNMC = $171.8 (Groups = 11)	CELL 2 X̄ CNMC = $232.7 (Groups = 15)	X̄ CNMC = $206.9 (Groups = 26)
HIGH	CELL 3 X̄ CNMC = $428.7 (Groups = 9)	CELL 4 X̄ CNMC = $382.7 (Groups = 7)	X̄ CNMC = $408.6 (Groups = 16)
TOTAL	X̄ CNMC = $287.4 (Groups = 20)	X̄ CNMC = $286.4 (Groups = 22)	X̄ CNMC = $283.7 (Groups = 42)

X̄ CNMC = Mean cumulative net marketing contribution in millions of dollars

TABLE 5A.11 ANOVA:SCHEMA COMPLEXITY, INTEGRATION & PERF-UNFAVOURED GPS

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F VALUE	SIG. OF F
Main Effects	406817.984	2	203408.992	5.178	.010**
Integration	406313.016	1	406313.016	10.343	.003**
Schema Complexity	4115.250	1	4115.250	.105	.748
2-Way Interaction	27769.224	1	27769.224	.707	.406
Explained	434587.208	3	144862.403	3.688	.020**
Residual	1492794.365	38	39284.062		
Total	1927381.573	41	47009.307		

TABLE 5A.12 ANOVA: CELL CONTRASTS - SCHEMA COMPLEXITY (UNFAVOURED GPS)

CELL CONTRAST	T VALUE	T PROBABILITY
Cell 1 - Cell 2	.774	.444
Cell 1 - Cell 3	-2.884	.006**
Cell 1 - Cell 4	-2.201	.034**
Cell 2 - Cell 3	-2.345	.024**
Cell 2 - Cell 4	-1.653	.106
Cell 3 - Cell 4	.461	.648

APPENDIX 5B - ANOVA: ALL MEASURES

Table 5B.1 indicates the measures for interpretation, integration and the results of the two way analysis of variance. The first column in the results section indicates whether there was an overall main effect. The second and third columns identify whether there was a main effect for any of the independent variables, while the third column, labelled 'I' indicates whether there was an interaction effect between the independent variables. The fifth column indicates the level of significance. For more detailed information on the results, see the corresponding table listed in the last column.

As discussed in Chapter IV, level of interpretation should be weighted by an individual's level of influence on the group since it is expected that individuals with little influence, will have little impact on the organization schema that arises. As well, two other measures of group participation were obtained: 1) level of involvement in the process; and 2) level of influence on the respondent, rather than the group. Each of the interpretation constructs was weighted by the three measures of participation. Level of influence on the group was designated with a 'G', level of involvement with a 'V', and level of influence on the respondent with an 'M'.

TABLE 5B.1 ANOVA: INTERPRETATION BY INTEGRATION BY PERFORMANCE (ALL GPS)

INTERP-RETATION (A)	INTEG-RATION (B)	RESULTS Main Effect	Inter-action			Total Effect	REF. TABLE
VIEW DIVERGENCE		Main	A	B	I	Total	
VDBEG							
VDBEG	SUPUND	.000*	.240	.001*	.052*	.000*	5.B1a
GVDBEG	SUPUND	.000*	.115	.000*	.080*	.000*	5.B1a
MVDBEG	SUPUND	.000*	.177	.001*	.078*	.000*	5.B1a
VVDBEG	SUPUND	.000*	.240	.001*	.052*	.000*	5.B1a
VDBEG	DISCUSS	.024*	.062	.089*	.008*	.003*	5.B1b
GVDBEG	DISCUSS	.014*	.033*	.073*	.012*	.003*	5.B1b
MVDBEG	DISCUSS	.024*	.062	.089*	.008*	.003*	5.B1b
VVDBEG	DISCUSS	.018*	.043*	.095*	.012*	.003*	5.B1b
VDBEG	SVE	.063	.101	.239	.622	.121	5.B1c
GVDBEG	SVE	.047*	.071	.257	.739	.099	5.B1c
MVDBEG	SVE	.063	.101	.239	.622	.121	5.B1c
VVDBEG	SVE	.046*	.070	.255	.506	.086	5.B1c
VDBEG	VDEND	.065	.024*	.189	.290	.074	5.B1d
GVDBEG	VDEND	.054*	.024*	.189	.290	.074	5.B1d
MVDBEG	VDEND	.065	.030*	.158	.361	.098	5.B1d
VVDBEG	VDEND	.057	.025*	.194	.904	.122	5.B1d
VDRANK							
VDRNK	SUPUND	.000*	.016*	.000*	.236	.000*	5.B1e
GVDRNK	SUPUND	.000*	.003*	.000*	.916	.000*	5.B1e
MVDRNK	SUPUND	.000*	.001*	.000*	.794	.000*	5.B1e
VVDRNK	SUPUND	.000*	.008*	.000*	.516	.000*	5.B1e
VDRNK	DISCUSS	.017*	.036*	.064*	.299	.028*	5.B1f
GVDRNK	DISCUSS	.004*	.007*	.091*	.404	.008*	5.B1f
MVDRNK	DISCUSS	.001*	.002*	.062*	.480	.003*	5.B1f
VVDRNK	DISCUSS	.017*	.034*	.064*	.311	.027*	5.B1f
VDRNK	SVE	.026*	.036*	.104*	.250	.035*	5.B1g
GVDRNK	SVE	.005*	.006*	.142	.156	.006*	5.B1g
MVDRNK	SVE	.001*	.001*	.099*	.113	.001*	5.B1g
VVDRNK	SVE	.024*	.033*	.104*	.238	.033*	5.B1g
VDRNK	VDEND	.108	.054*	.441	.535	.184	5.B1h
GVDRNK	VDEND	.021*	.008*	.448	.462	.040*	5.B1h
MVDRNK	VDEND	.008*	.003*	.451	.691	.019*	5.B1h
VVDRNK	VDEND	.114	.057	.518	.892	.221	5.B1h
CAUSE							
CAUSE	SUPUND	.001*	.472	.000*	.700	.002*	5.B1i
GCAUSE	SUPUND	.001*	.472	.000*	.700	.002*	5.B1i
MCAUSE	SUPUND	.001*	.472	.000*	.700	.002*	5.B1i
VCAUSE	SUPUND	.001*	.472	.000*	.700	.002*	5.B1i
CAUSE	DISCUSS	.077	.234	.062*	.230	.089	5.B1j
GCAUSE	DISCUSS	.077	.234	.062*	.230	.089	5.B1j
MCAUSE	DISCUSS	.077	.234	.062*	.230	.089	5.B1j
VCAUSE	DISCUSS	.131	.616	.055*	.055*	.055	5.B1j

CAUSE	SVE	.139	.310	.129	.144	.110	5.B1k
GCAUSE	SVE	.139	.310	.129	.144	.110	5.B1k
MCAUSE	SVE	.139	.310	.129	.144	.110	5.B1k
VCAUSE	SVE	.230	.757	.108	.465	.323	5.B1k
CAUSE	VDEND	.207	.123	.280	.046*	.072	5.B1l
GCAUSE	VDEND	.207	.123	.280	.046*	.072	5.B1l
MCAUSE	VDEND	.207	.123	.280	.046*	.072	5.B1l
VCAUSE	VDEND	.500	.416	.341	.205	.393	5.B1l
SCHEMA COMPLEXITY							
COMP	SUPUND	.001*	.829	.000*	.336	.002*	5.B1m
GCOMP	SUPUND	.001*	.762	.000*	.292	.001*	5.B1m
MCOMP	SUPUND	.001*	.762	.000*	.292	.001*	5.B1m
VCOMP	SUPUND	.001*	.878	.000*	.596	.002*	5.B1m
COMP	DISCUSS	.159	.991	.056*	.301	.193	5.B1n
GCOMP	DISCUSS	.158	.946	.056*	.264	.178	5.B1n
MCOMP	DISCUSS	.139	.575	.057*	.640	.243	5.B1n
VCOMP	DISCUSS	.158	.946	.056*	.264	.178	5.B1n
COMP	SVE	.220	.697	.083*	.256	.230	5.B1o
GCOMP	SVE	.213	.638	.080*	.293	.242	5.B1o
MCOMP	SVE	.225	.860	.104*	.084	.117	5.B1o
VCOMP	SVE	.213	.638	.080*	.293	.242	5.B1o
COMP	VDEND	.658	.720	.375	.351	.633	5.B1p
GCOMP	VDEND	.682	.822	.389	.242	.542	5.B1p
MCOMP	VDEND	.497	.417	.336	.078	.213	5.B1p
VCOMP	VDEND	.682	.822	.389	.242	.542	5.B1p
INTERPRETATION							
INTERP	SUPUND	.001*	.780	.000*	.317	.002*	5.B1q
GINTERP	SUPUND	.001*	.444	.000*	.291	.001*	5.B1q
MINTERP	SUPUND	.001*	.412	.000*	.267	.001*	5.B1q
VINTERP	SUPUND	.001*	.769	.000*	.203	.001*	5.B1q
INTERP	DISCUSS	.092	.318	.080*	.103*	.062	5.B1r
GINTERP	DISCUSS	.061	.179	.072*	.090*	.040*	5.B1r
MINTERP	DISCUSS	.057	.163	.072*	.080*	.035*	5.B1r
VINTERP	DISCUSS	.107	.421	.057*	.058*	.048*	5.B1r
INTERP	SVE	.169	.401	.166	.425	.241	5.B1s
GINTERP	SVE	.122	.246	.164	.472	.193	5.B1s
MINTERP	SVE	.115	.226	.167	.502	.189	5.B1s
VINTERP	SVE	.202	.545	.120	.628	.327	5.B1s
INTERP	VDEND	.155	.086	.245	.034*	.045*	5.B1t
GINTERP	VDEND	.115	.060	.278	.041*	.040*	5.B1t
MINTERP	VDEND	.179	.103	.313	.021*	.036*	5.B1t
VINTERP	VDEND	.354	.249	.359	.069	.148	5.B1t

TABLE 5B-1A

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT SUPUND + VDBEG o	9.242 13.117 1.404	.000 .001 .240
INTERACTION EFFECT	3.920	.052
EXPLAINED VARIANCE	7.468	.000

		VDBEG Low	VDBEG High	$\bar{X}$
SUPUND	Low	459.74 (13)	235.35 (23)	316.38 (36)
	High	581.19 (22)	643.66 (12)	603.24 (34)
	$\bar{X}$	536.08 (35)	375.34 (35)	70

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT SUPUND + VDBEG o	9.861 13.464 2.547	.000 .000 .115
INTERACTION EFFECT	3.167	.08
EXPLAINED VARIANCE	7.629	.000

		VDBEG Low	VDBEG High	$\bar{X}$
SUPUND	Low	460.58 (14)	224.61 (21)	316.38 (36)
	High	596.69 (21)	613.81 (13)	603.24 (34)
	$\bar{X}$	542.25 (35)	369.17 (35)	70

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT SUPUND + VDBEG o	9.439 12.696 1.861	.000 .001 .177
INTERACTION EFFECT	3.198	.078
EXPLAINED VARIANCE	7.359	.000

		VDBEG Low	VDBEG High	$\bar{X}$
SUPUND	Low	459.74 (13)	235.35 (23)	316.38 (36)
	High	590.81 (22)	626.02 (12)	603.24 (35)
	$\bar{X}$	542.13 (35)	369.29 (35)	70

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT SUPUND + VDBEG o	9.242 13.117 1.404	.000 .001 .240
INTERACTION EFFECT	3.920	.052
EXPLAINED VARIANCE	7.468	.000

		VDBEG Low	VDBEG High	$\bar{X}$
SUPUND	Low	459.74 (13)	235.35 (23)	316.38 (36)
	High	581.19 (22)	643.66 (12)	603.24 (34)
	$\bar{X}$	536.08 (35)	375.34 (35)	70

+ Support\Understanding
o View Divergence (beginning) - Cause Map & Rank

TABLE 5B-1B

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT DISCUSS + VDBEG o	3.968 2.987 3.592	.024 .089 .062
INTERACTION EFFECT	7.581	.008
EXPLAINED VARIANCE	5.172	.003

DISCUSS \ VDBEG	Low	High	$\bar{X}$
Low	577.9 (15)	243 (21)	382.54 (36)
High	504.71 (20)	573.86 (14)	533.18 (34)
$\bar{X}$	536.08 (35)	375.34 (35)	70

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT DISCUSS + VDBEG o	4.540 3.329 4.727	.014 .073 .033
INTERACTION EFFECT	6.639	.012
EXPLAINED VARIANCE	5.240	.003

DISCUSS \ VDBEG	Low	High	$\bar{X}$
Low	571.25 (16)	231.57 (20)	382.54 (36)
High	517.82 (19)	552.64 (15)	533.18 (34)
$\bar{X}$	542.25 (35)	369.17 (35)	70

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT DISCUSS + VDBEG o	4.287 2.875 4.249	.018 .095 .043
INTERACTION EFFECT	6.621	.012
EXPLAINED VARIANCE	5.065	.003

DISCUSS \ VDBEG	Low	High	$\bar{X}$
Low	577.90 (15)	243.0 (21)	382.54 (36)
High	515.29 (20)	558.74 (14)	533.18 (34)
$\bar{X}$	542.13 (35)	369.29 (35)	70

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT DISCUSS + VDBEG o	3.968 2.987 3.592	.024 .089 .062
INTERACTION EFFECT	7.581	.008
EXPLAINED VARIANCE	5.172	.003

DISCUSS \ VDBEG	Low	High	$\bar{X}$
Low	577.9 (15)	243.0 (21)	382.54 (36)
High	504.71 (20)	573.86 (14)	533.18 (34)
$\bar{X}$	536.08 (35)	375.34 (35)	70

+ Discussion
o View Divergence (beginning) - Cause Map & Rank

TABLE 5B-1C

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.892	.063
SVE +	1.411	.239
VDBEG o	2.770	.101
INTERACTION EFFECT	.245	.622
EXPLAINED VARIANCE	2.010	.121

SVE	VDBEG Low	VDBEG High	$\bar{X}$
Low	451.64 (13)	356.51 (23)	390.86 (36)
High	585.97 (22)	411.43 (12)	524.37 (34)
$\bar{X}$	538.68 (35)	375.34 (35)	70

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	3.207	.047
SVE +	1.309	.257
VDBEG o	3.379	.071
INTERACTION EFFECT	.112	.739
EXPLAINED VARIANCE	2.175	.099

SVE	VDBEG Low	VDBEG High	$\bar{X}$
Low	468.25 (13)	347.13 (23)	390.86 (36)
High	585.97 (22)	411.43 (12)	524.37 (34)
$\bar{X}$	542.25 (35)	369.17 (35)	70

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	3.217	.046
SVE +	1.317	.255
VDBEG o	3.383	.070
INTERACTION EFFECT	447	.506
EXPLAINED VARIANCE	2.293	.086

SVE	VDBEG Low	VDBEG High	$\bar{X}$
Low	451.64 (13)	356.51 (23)	390.86 (36)
High	595.60 (22)	393.78 (12)	524.37 (34)
$\bar{X}$	542.13 (35)	369.29 (35)	70

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.892	.063
SVE +	1.411	.239
VDBEG o	2.770	.101
INTERACTION EFFECT	.245	.622
EXPLAINED VARIANCE	2.010	.121

SVE	VDBEG Low	VDBEG High	$\bar{X}$
Low	451.64 (13)	356.51 (23)	390.86 (36)
High	585.97 (22)	411.43 (12)	524.37 (34)
$\bar{X}$	536.08 (35)	375.34 (35)	70

+ Shared Views End

o View Divergence (beginning) - Cause Map & Rank

TABLE 5B-1D

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT VDEND + VDBEG o	2.862 2.041 4.954	.065 .158 .030
INTERACTION EFFECT	.847	.361
EXPLAINED VARIANCE	2.190	.098

VDEND \ VDBEG	Low	High	$\bar{X}$
Low	527.01 (21)	262.50 (12)	430.83 (33)
High	570.58 (12)	461.21 (20)	502.23 (32)
$\bar{X}$	542.86 (33)	386.70 (32)	65

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT VDEND + VDBEG o	3.072 1.761 5.365	.054 .189 .024
INTERACTION EFFECT	1.139	.290
EXPLAINED VARIANCE	2.427	.074

VDEND \ VDBEG	Low	High	$\bar{X}$
Low	540.59 (20)	261.97 (13)	430.83 (33)
High	562.96 (13)	460.67 (19)	502.23 (32)
$\bar{X}$	549.40 (33)	379.95 (32)	65

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT VDEND + VDBEG o	3.008 1.727 5.252	.057 .194 .025
INTERACTION EFFECT	.015	.904
EXPLAINED VARIANCE	2.010	.122

VDEND \ VDBEG	Low	High	$\bar{X}$
Low	502.16 (20)	321.08 (13)	430.83 (33)
High	621.75 (13)	420.45 (19)	502.23 (32)
$\bar{X}$	549.27 (33)	380.08 (32)	65

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT VDEND + VDBEG o	2.862 2.041 4.954	.065 .158 .030
INTERACTION EFFECT	.847	361
EXPLAINED VARIANCE	2.190	.098

VDEND \ VDBEG	Low	High	$\bar{X}$
Low	527.01 (21)	262.50 (12)	430.83 (33)
High	570.58 (12)	461.21 (20)	502.23 (32)
$\bar{X}$	542.86 (33)	386.70 (32)	65

\+ View Divergence (end) - Cause Mop & Rank
o View Divergence (begining) - Cause Mop & Rank

TABLE 5B-1E

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	11.856	.000
SUPUND +	17.610	.000
VDRANK o	6.102	.016
INTERACTION EFFECT	1.432	.236
EXPLAINED VARIANCE	8.381	.000

SUPUND \ VDRANK	Low	High	$\bar{X}$
Low	440.51 (18)	192.29 (18)	316.38 (36)
High	654.55 (17)	560.92 (17)	603.24 (34)
$\bar{X}$	540.10 (35)	371.31 (35)	70

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	13.662	.000
SUPUND +	16.527	.000
VDRANK o	9.291	.003
INTERACTION EFFECT	.011	.916
EXPLAINED VARIANCE	9.112	.000

SUPUND \ VDRANK	Low	High	$\bar{X}$
Low	421.51 (17)	222.32 (19)	316.38 (36)
High	707.72 (18)	490.19 (16)	603.24 (34)
$\bar{X}$	566.65 (35)	344.77 (35)	70

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	12.649	.000
SUPUND +	19.011	.000
VDRANK o	7.576	.008
INTERACTION EFFECT	.427	.516
EXPLAINED VARIANCE	8.575	.000

SUPUND \ VDRANK	Low	High	$\bar{X}$
Low	425.51 (19)	194.41 (17)	316.38 (36)
High	678.36 (16)	536.46 (18)	603.24 (34)
$\bar{X}$	541.10 (35)	370.32 (35)	70

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	15.449	.000
SUPUND +	16.990	.000
VDRANK o	12.163	.001
INTERACTION EFFECT	.069	.794
EXPLAINED VARIANCE	10.322	.000

SUPUND \ VDRANK	Low	High	$\bar{X}$
Low	447.42 (17)	199.13 (19)	316.38 (36)
High	707.72 (18)	490.19 (16)	603.24 (34)
$\bar{X}$	579.23 (35)	332.18 (35)	70

\+ Support/Understanding
o View Divergence on Rank

TABLE 5.B1F

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	4.307	.017
DISCUSS +	3.545	.064
VDRANK o	4.580	.036
INTERACTION EFFECT	1.097	.299
EXPLAINED VARIANCE	3.327	.028

DISCUSS \ VDRANK	Low	High	$\bar{X}$
Low	507.68 (17)	270.57 (19)	382.54 (36)
High	570.72 (18)	490.95 (16)	533.18 (34)
$\bar{X}$	540.10 (35)	371.31 (35)	70

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	6.025	.004
DISCUSS +	2.94	.091
VDRANK o	7.854	.007
INTERACTION EFFECT	.706	.404
EXPLAINED VARIANCE	4.252	.008

DISCUSS \ VDRANK	Low	High	$\bar{X}$
Low	531.29 (16)	263.54 (20)	382.54 (36)
High	596.42 (19)	453.09 (15)	533.18 (34)
$\bar{X}$	566.65 (35)	344.77 (35)	70

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	4.368	.017
DISCUSS +	3.543	.064
VDRANK o	4.698	.034
INTERACTION EFFECT	1.041	.311
EXPLAINED VARIANCE	3.259	.027

DISCUSS \ VDRANK	Low	High	$\bar{X}$
Low	507.68 (17)	207.57 (19)	382.54 (36)
High	572.66 (18)	488.77 (16)	533.18 (34)
$\bar{X}$	541.10 (35)	370.32 (35)	70

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	7.665	.001
DISCUSS +	3.593	.062
VDRANK o	10.969	.002
INTERACTION EFFECT	.505	.480
EXPLAINED VARIANCE	5.278	.003

DISCUSS \ VDRANK	Low	High	$\bar{X}$
Low	535.11 (17)	246.03 (19)	382.54 (36)
High	620.91 (18)	434.49 (16)	533.18 (34)
$\bar{X}$	579.23 (35)	332.18 (35)	70

+ Discussion
o View Divergence on Rank

TABLE 5B-1G

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT SVE + VDRANK o	3.870 2.713 4.589	.026 .104 .036
INTERACTION EFFECT	1.350	.250
EXPLAINED VARIANCE	3.030	.035

SVE	VDRANK Low	VDRANK High	$\bar{X}$
Low	43128 (17)	354.71 (19)	390.86 (36)
High	642.88 (18)	391.04 (16)	524.37 (34)
$\bar{X}$	540.10 (35)	371.31 (35)	70

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT SVE + VDRANK o	5.701 2.210 8.077	.005 .142 .006
INTERACTION EFFECT	2.061	.156
EXPLAINED VARIANCE	4.488	.006

SVE	VDRANK Low	VDRANK High	$\bar{X}$
Low	450.11 (16)	343.46 (20)	390.86 (36)
High	664.78 (19)	346.51 (15)	524.37 (34)
$\bar{X}$	566.65 (35)	344.77 (35)	70

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT SVE + VDRANK o	3.938 2.716 4.725	.024 .104 .033
INTERACTION EFFECT	1.418	.238
EXPLAINED VARIANCE	3.098	.033

SVE	VDRANK Low	VDRANK High	$\bar{X}$
Low	431.28 (17)	354.71 (19)	390.86 (36)
High	644.82 (18)	388.86 (16)	524.37 (34)
$\bar{X}$	541.10 (35)	370.32 (35)	70

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT SVE + VDRANK o	7.374 2.797 11.261	.001 .099 .001
INTERACTION EFFECT	2.578	.113
EXPLAINED VARIANCE	5.775	.001

SVE	VDRANK Low	VDRANK High	$\bar{X}$
Low	458.70 (17)	330.17 (19)	390.86 (36)
High	693.07 (18)	334.58 (16)	524.37 (34)
$\bar{X}$	579.23 (35)	332.18 (35)	70

+ Shared Views End
o View Divergence on Rank

TABLE 5B-1H

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.304	.108
VDEND +	.601	.441
VDRANK o	3.857	.054
INTERACTION EFFECT	.389	.535
EXPLAINED VARIANCE	1.666	.184

VDEND \ VDRANK	Low	High	$\bar{X}$
Low	488.16 (16)	376.86 (17)	430.83 (33)
High	602.62 (17)	388.45 (15)	502.23 (32)
$\bar{X}$	547.13 (33)	382.29 (32)	65

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	4.138	.021
VDEND +	.584	.448
VDRANK o	7.480	.008
INTERACTION EFFECT	.547	.462
EXPLAINED VARIANCE	2.941	.040

VDEND \ VDRANK	Low	High	$\bar{X}$
Low	573.76 (16)	296.30 (17)	430.83 (33)
High	576.71 (17)	417.82 (15)	502.23 (32)
$\bar{X}$	575.38 (33)	353.26 (32)	65

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.253	.114
VDEND +	.422	.518
VDRANK o	3.759	.057
INTERACTION EFFECT	.019	.892
EXPLAINED VARIANCE	1.508	.221

VDEND \ VDRANK	Low	High	$\bar{X}$
Low	512.66 (15)	362.63 (18)	430.83 (33)
High	577.78 (18)	405.09 (14)	502.23 (32)
$\bar{X}$	548.18 (33)	381.21 (32)	65

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	5.259	.008
VDEND +	.575	.451
VDRANK o	9.702	.003
INTERACTION EFFECT	.160	.691
EXPLAINED VARIANCE	3.559	.019

VDEND \ VDRANK	Low	High	$\bar{X}$
Low	573.76 (16)	296.30 (17)	430.83 (33)
High	602.62 (17)	388.45 (15)	502.23 (32)
$\bar{X}$	588.63 (33)	339.49 (32)	65

+ View Divergence (end) - Cause Map & Rank
o View Divergence on Rank

TABLE 5B-11

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	8.245	.001
SUPUND+	14.536	.000
CAUSE ○	.523	.472
INTERACTION EFFECT	.150	.700
EXPLAINED VARIANCE	5.547	.002

SUPUND \ CAUSE	Low	High	$\bar{X}$
Low	363.07 (15)	283.02 (21)	316.38 (36)
High	619.94 (20)	589.37 (14)	603.24 (34)
$\bar{X}$	505.85 (35)	405.56 (35)	70

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	8.245	.001
SUPUND+	14.536	.000
CAUSE ○	.523	.472
INTERACTION EFFECT	.150	.700
EXPLAINED VARIANCE	5.547	.002

SUPUND \ CAUSE	Low	High	$\bar{X}$
Low	363.07 (15)	283.02 (21)	316.38 (36)
High	612.94 (20)	589.37 (14)	603.24 (34)
$\bar{X}$	505.85 (35)	405.56 (35)	70

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	7.963	.001
SUPUND+	15.503	.000
CAUSE ○	.038	.845
INTERACTION EFFECT	.306	.582
EXPLAINED VARIANCE	5.411	.002

SUPUND \ CAUSE	Low	High	$\bar{X}$
Low	345.88 (16)	292.77 (20)	316.38 (36)
High	591.30 (19)	618.35 (15)	603.24 (34)
$\bar{X}$	479.11 (35)	432.31 (35)	70

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	8.245	.001
SUPUND+	14.536	.000
CAUSE ○	.523	.472
INTERACTION EFFECT	.150	.700
EXPLAINED VARIANCE	5.547	.002

SUPUND \ CAUSE	Low	High	$\bar{X}$
Low	363.07 (15)	283.02 (21)	316.38 (36)
High	612.94 (20)	589.37 (14)	603.24 (34)
$\bar{X}$	505.85 (35)	405.56 (35)	70

\+ Support/Understanding
○ View Divergence Cause Map

TABLE 5.BIJ

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.661	.077
DISCUSS +	3.601	.062
CAUSE o	1.443	.234
INTERACTION EFFECT	1.470	.230
EXPLAINED VARIANCE	2.264	.089

DISCUSS	CAUSE Low	CAUSE High	$\bar{X}$
Low	478.71 (17)	296.49 (19)	382.54 (36)
High	531.49 (18)	535.08 (16)	533.18 (34)
$\bar{X}$	505.85 (35)	405.56 (35)	70

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.661	.077
DISCUSS +	3.601	.062
CAUSE o	1.443	.234
INTERACTION EFFECT	1.470	.230
EXPLAINED VARIANCE	2.264	.089

DISCUSS	CAUSE Low	CAUSE High	$\bar{X}$
Low	478.71 (17)	296.49 (19)	382.54 (36)
High	531.49 (18)	535.08 (16)	533.18 (34)
$\bar{X}$	505.85 (35)	405.56 (35)	70

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.099	.131
DISCUSS +	3.817	.055
CAUSE o	.254	.616
INTERACTION EFFECT	3.801	.055
EXPLAINED VARIANCE	2.666	.055

DISCUSS	CAUSE Low	CAUSE High	$\bar{X}$
Low	478.71 (17)	296.49 (19)	382.54 (36)
High	479.49 (18)	593.59 (16)	533.18 (34)
$\bar{X}$	479.11 (35)	432.31 (35)	70

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.661	.077
DISCUSS +	3.601	.062
CAUSE o	1.443	.234
INTERACTION EFFECT	1.470	.230
EXPLAINED VARIANCE	2.264	.089

DISCUSS	CAUSE Low	CAUSE High	$\bar{X}$
Low	478.71 (17)	296.49 (19)	382.54 (36)
High	531.49 (18)	535.08 (16)	533.18 (34)
$\bar{X}$	505.85 (35)	405.56 (35)	70

+ DISCUSS
o VIEW DIVERGENCE CAUSE MAP

TABLE 5.BIK

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.036	.139
SVE+	2.364	.129
CAUSE o	1.048	.310
INTERACTION EFFECT	2.188	.144
EXPLAINED VARIANCE	2.087	.110

SVE \ CAUSE	Low	High	$\bar{X}$
Low	372.18 (15)	404.21 (21)	390.86 (36)
High	606.11 (20)	407.59 (14)	524.37 (34)
$\bar{X}$	505.85 (35)	405.56 (35)	70

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.036	.139
SVE+	2.364	.129
CAUSE o	1.048	.310
INTERACTION EFFECT	2.188	.144
EXPLAINED VARIANCE	2.087	.110

SVE \ CAUSE	Low	High	$\bar{X}$
Low	372.18 (15)	404.21 (21)	390.86 (36)
High	606.11 (20)	407.59 (14)	524.37 (34)
$\bar{X}$	505.85 (35)	405.56 (35)	70

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	1.503	.230
SVE+	2.649	.108
CAUSE o	.096	.757
INTERACTION EFFECT	.541	.465
EXPLAINED VARIANCE	1.183	.323

SVE \ CAUSE	Low	High	$\bar{X}$
Low	372.18 (15)	404.21 (21)	390.86 (36)
High	559.30 (20)	474.46 (14)	524.37 (34)
$\bar{X}$	479.11 (35)	432.31 (35)	70

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.036	.139
SVE+	2.364	.129
CAUSE o	1.048	.310
INTERACTION EFFECT	2.188	.144
EXPLAINED VARIANCE	2.087	.110

SVE \ CAUSE	Low	High	$\bar{X}$
Low	372.18 (15)	404.21 (21)	390.86 (36)
High	606.11 (20)	407.59 (14)	524.37 (34)
$\bar{X}$	505.85 (35)	405.56 (35)	70

+ SHARED VIEWS END
o VIEW DIVERGENCE ON CAUSE MAP

TABLE 5.B1L

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	1.615	.207
VDEND +	1.189	.280
CAUSE o	2.452	.123
INTERACTION EFFECT	4.135	.046
EXPLAINED VARIANCE	2.445	.072

VDEND \ CAUSE	Low	High	$\bar{X}$
Low	554.74 (19)	216.66 (14)	430.83 (33)
High	479.65 (14)	519.79 (18)	502.23 (32)
$\bar{X}$	522.88 (33)	407.30 (32)	65

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	1.615	.207
VDEND +	1.189	.280
CAUSE o	2.452	.123
INTERACTION EFFECT	4.135	.046
EXPLAINED VARIANCE	2.455	.072

VDEND \ CAUSE	Low	High	$\bar{X}$
Low	554.74 (19)	262.66 (14)	430.83 (33)
High	479.65 (14)	519.79 (18)	502.23 (32)
$\bar{X}$	522.88 (33)	407.30 (32)	65

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	.701	.500
VDEND +	.920	.341
CAUSE o	.671	.416
INTERACTION EFFECT	1.639	.205
EXPLAINED VARIANCE	1.013	.393

VDEND \ CAUSE	Low	High	$\bar{X}$
Low	505.47 (19)	329.53 (14)	430.83 (33)
High	479.65 (14)	519.79 (18)	502.23 (32)
$\bar{X}$	494.52 (33)	436.55 (32)	65

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	1.615	.207
VDEND +	1.189	.280
CAUSE o	2.452	.123
INTERACTION EFFECT	4.135	.046
EXPLAINED VARIANCE	2.455	.072

VDEND \ CAUSE	Low	High	$\bar{X}$
Low	554.74 (19)	262.66 (14)	430.83 (33)
High	479.65 (14)	519.79 (18)	502.23 (32)
$\bar{X}$	522.88 (33)	407.30 (32)	65

\+ View Divergence (end) - Cause Map & Rank
o View Divergence Cause Map

TABLE 5.B1M

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	8.044	.001
SUPUND +	16.089	.000
COMP ○	.047	.829
INTERACTION EFFECT	.941	.336
EXPLAINED VARIANCE	5.677	.002

SUPUND \ COMP	Low	High	$\bar{X}$
Low	343.86 (17)	291.79 (19)	316.38 (36)
High	562.24 (18)	649.35 (16)	603.24 (34)
$\bar{X}$	456.17 (35)	455.25 (35)	70

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	8.095	.001
SUPUND +	16.184	.000
COMP ○	.092	.762
INTERACTION EFFECT	1.127	.292
EXPLAINED VARIANCE	5.772	.001

SUPUND \ COMP	Low	High	$\bar{X}$
Low	343.86 (17)	291.79 (19)	316.38 (36)
High	556.20 (18)	656.15 (16)	603.24 (34)
$\bar{X}$	453.06 (35)	458.35 (35)	70

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	8.095	.001
SUPUND +	16.184	.000
COMP ○	.092	.762
INTERACTION EFFECT	1.127	.292
EXPLAINED VARIANCE	5.772	.001

SUPUND \ COMP	Low	High	$\bar{X}$
Low	343.86 (17)	291.79 (19)	316.38 (36)
High	556.20 (18)	656.15 (16)	603.24 (34)
$\bar{X}$	453.06 (35)	458.35 (35)	70

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	7.952	.001
SUPUND +	15.533	.000
COMP ○	.024	.878
INTERACTION EFFECT	.285	.596
EXPLAINED VARIANCE	5.396	.002

SUPUND \ COMP	Low	High	$\bar{X}$
Low	343.42 (16)	294.75 (20)	316.38 (36)
High	590.61 (19)	619.23 (15)	603.24 (34)
$\bar{X}$	477.61 (35)	433.81 (35)	70

+ Support/Understanding
○ Schema Complexity

TABLE 5.B1a

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT DISCUSS + COMP o	1.888 3.776 .000	.159 .056 .991
INTERACTION EFFECT	1.085	.301
EXPLAINED VARIANCE	1.620	.193

DISCUS	COMP Low	COMP High	$\bar{X}$
Low	422.23 (18)	343.85 (18)	382.54 (36)
High	492.11 (17)	574.25 (17)	533.18 (34)
$\bar{X}$	456.17 (35)	455.25 (35)	70

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT SUPUND + COMP o	1.895 3.786 .005	.158 .056 .946
INTERACTION EFFECT	1.267	.264
EXPLAINED VARIANCE	1.686	.178

DISCUS	COMP Low	COMP High	$\bar{X}$
Low	422.23 (18)	[illegible] (18)	382.54 (36)
High	485.71 (17)	580.65 (17)	533.18 (34)
$\bar{X}$	453.06 (35)	458.35 (35)	70

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT DISCUSS + COMP o	1.895 3.786 .005	.158 .056 .946
INTERACTION EFFECT	1.267	.264
EXPLAINED VARIANCE	1.686	.178

DISCUS	COMP Low	COMP High	$\bar{X}$
Low	422.23 (18)	342.85 (18)	382.54 (36)
High	485.71 (17)	580.65 (17)	533.18 (34)
$\bar{X}$	453.06 (35)	458.35 (35)	70

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT DISCUSS + COMP o	2.031 3.745 .317	.139 .057 .575
INTERACTION EFFECT	.221	.640
EXPLAINED VARIANCE	1.428	.243

DISCUS	COMP Low	COMP High	$\bar{X}$
Low	422.23 (18)	342.85 (18)	382.54 (36)
High	536.24 (17)	530.12 (17)	533.18 (34)
$\bar{X}$	477.61 (35)	433.81 (35)	70

+ Discussion
o Schema Complexity

TABLE 5.B10

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT SVE + COMP ○	1.550 3.099 .153	.220 .083 .697
INTERACTION EFFECT	1.315	.256
EXPLAINED VARIANCE	1.471	.230

SVE \ COMP	Low	High	$\bar{X}$
Low	317.58 (14)	437.50 (22)	390.86 (36)
High	548.57 (21)	485.28 (13)	524.37 (34)
$\bar{X}$	456.17 (35)	455.25 (35)	70

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT SVE + COMP ○	1.582 3.160 .223	.213 .080 .638
INTERACTION EFFECT	1.125	.293
EXPLAINED VARIANCE	1.430	.242

SVE \ COMP	Low	High	$\bar{X}$
Low	317.58 (14)	437.50 (22)	390.86 (36)
High	543.39 (21)	493.65 (13)	524.37 (34)
$\bar{X}$	453.06 (35)	458.35 (35)	70

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT SVE + COMP ○	1.582 3.160 .223	.213 .080 .638
INTERACTION EFFECT	1.125	.293
EXPLAINED VARIANCE	1.430	.242

SVE \ COMP	Low	High	$\bar{X}$
Low	317.58 (14)	437.50 (22)	390.86 (36)
High	543.39 (21)	493.65 (13)	524.37 (34)
$\bar{X}$	453.06 (35)	458.35 (35)	70

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT SVE + COMP ○	1.525 2.725 .032	.225 .104 .860
INTERACTION EFFECT	3.070	.084
EXPLAINED VARIANCE	2.040	.117

SVE \ COMP	Low	High	$\bar{X}$
Low	317.58 (14)	437.50 (22)	390.86 (36)
High	584.29 (21)	427.57 (13)	524.37 (34)
$\bar{X}$	477.61 (35)	433.81 (35)	70

+ Shared Views End
○ Schema Complexity

TABLE 5.b1p

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT VDEND + COMP o	.422 .800 .129	.658 .375 .720
INTERACTION EFFECT	.882	.351
EXPLAINED VARIANCE	.575	.633

VDEND \ COMP	Low	High	$\bar{X}$
Low	477.32 (19)	367.74 (14)	430.83 (33)
High	471.72 (13)	523.11 (19)	502.23 (32)
$\bar{X}$	475.04 (32)	457.19 (33)	65

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT VDEND + COMP o	.385 .753 .051	.682 .389 .822
INTERACTION EFFECT	1.397	.242
EXPLAINED VARIANCE	.723	.542

VDEND \ COMP	Low	High	$\bar{X}$
Low	484.12 (18)	366.87 (15)	430.83 (33)
High	455.59 (14)	538.50 (18)	502.23 (32)
$\bar{X}$	471.64 (32)	460.49 (33)	65

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT VDEND + COMP o	.385 .753 .051	.682 .389 .822
INTERACTION EFFECT	1.397	.242
EXPLAINED VARIANCE	.723	.542

VDEND \ [illegible]	Low	High	$\bar{X}$
Low	484.12 (18)	366.87 (15)	430.83 (33)
High	455.59 (14)	538.50 (18)	502.23 (32)
$\bar{X}$	471.64 (32)	460.49 (33)	65

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT VDEND + COMP o	.708 .940 .667	.497 .336 .417
INTERACTION EFFECT	3.206	.078
EXPLAINED VARIANCE	1.540	.213

VDEND \ COMP	Low	High	$\bar{X}$
Low	522.32 (19)	306.66 (14)	430.83 (33)
High	455.59 (14)	538.50 (18)	502.23 (32)
$\bar{X}$	494.01 (33)	437.07 (32)	65

+ View Divergence (ending) - Cause Map & Rank
o Schema Complexity

TABLE 5.B1q

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	8.073	.001
SUPUND +	14.145	.000
INTERP o	.079	.780
INTERACTION EFFECT	1.018	.317
EXPLAINED VARIANCE	5.722	.002

SUPUND \ INTERP	Low	High	$\bar{X}$
Low	376.29 (13)	282.51 (23)	316.38 (36)
High	583.15 (22)	640.06 (12)	603.24 (34)
$\bar{X}$	506.32 (35)	405.10 (35)	70

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	8.405	.001
SUPUND +	14.022	.000
INTERP o	.592	.444
INTERACTION EFFECT	1.133	.291
EXPLAINED VARIANCE	5.981	.001

SUPUND \ INTERP	Low	High	$\bar{X}$
Low	396.85 (14)	265.17 (22)	316.38 (36)
High	594.02 (21)	618.12 (13)	603.24 (34)
$\bar{X}$	515.15 (35)	396.26 (35)	70

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	8.155	.001
SUPUND +	15.348	.000
INTERP o	.087	.769
INTERACTION EFFECT	1.657	.203
EXPLAINED VARIANCE	5.989	.001

SUPUND \ INTERP	Low	High	$\bar{X}$
Low	381.42 (15)	269.92 (21)	316.38 (36)
High	572.52 (20)	647.11 (14)	603.24 (34)
$\bar{X}$	490.62 (35)	420.80 (35)	70

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	8.475	.001
SUPUND +	13.971	.000
INTERP o	.681	.412
INTERACTION EFFECT	1.253	.267
EXPLAINED VARIANCE	6.068	.001

SUPUND \ INTERP	Low	High	$\bar{X}$
Low	401.60 (14)	262.15 (22)	316.38 (36)
High	594.02 (21)	618.12 (13)	603.24 (34)
$\bar{X}$	517.05 (35)	394.36 (35)	70

+ Support/Understanding
o Interpretation

TABLE 5.B1r

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.47	.092
DISCUS +	3.166	.080
INTERP O	1.014	.318
INTERACTION EFFECT	2.737	.103
EXPLAINED VARIANCE	2.559	.062

		INTERP Low	INTERP High	$\bar{X}$
DISCUS	Low	500.07 (15)	298.59 (21)	382.54 (36)
	High	511.00 (20)	564.87 (14)	533.18 (34)
	$\bar{X}$	506.32 (35)	405.10 (35)	70

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.913	.061
DISCUS +	3.342	.072
INTERP O	1.841	.179
INTERACTION EFFECT	2.966	.09
EXPLAINED VARIANCE	2.931	.040

		INTERP Low	INTERP High	$\bar{X}$
DISCUS	Low	510.32 (16)	280.31 (20)	382.54 (36)
	High	519.22 (19)	550.87 (15)	533.18 (34)
	$\bar{X}$	515.15 (35)	396.26 (35)	70

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.309	.107
DISCUS +	3.767	.057
INTERP O	.657	.421
INTERACTION EFFECT	3.733	.058
EXPLAINED VARIANCE	2.784	.048

		INTERP Low	INTERP High	$\bar{X}$
DISCUS	Low	490.04 (17)	286.36 (19)	382.54 (36)
	High	491.17 (18)	580.44 (16)	533.18 (34)
	$\bar{X}$	490.62 (35)	420.80 (35)	70

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.997	.057
DISCUS +	3.337	.072
INTERP O	1.991	.163
INTERACTION EFFECT	3.153	.080
EXPLAINED VARIANCE	3.049	.035

		INTERP Low	INTERP High	$\bar{X}$
DISCUS	Low	514.48 (16)	276.99 (20)	382.54 (36)
	High	519.22 (19)	550.87 (15)	533.18 (34)
	$\bar{X}$	517.05 (35)	394.36 (35)	70

\+ Discussion
O Interpretation

TABLE 5.B1a

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	1.829	.169
SVE +	1.965	.166
INTERP o	.716	.401
INTERACTION EFFECT	.644	.425
EXPLAINED VARIANCE	1.434	.24[illegible]

SVE \ INTERP	Low	High	$\bar{X}$
Low	394.50 (13)	388.81 (23)	390.86 (36)
High	572.39 (22)	436.32 (12)	524.37 (34)
$\bar{X}$	506.32 (35)	405.10 (35)	70

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.169	.122
SVE +	1.984	.164
INTERP o	1.372	.246
INTERACTION EFFECT	.523	.472
EXPLAINED VARIANCE	1.620	.193

SVE \ INTERP	Low	High	$\bar{X}$
Low	413.76 (14)	376.30 (22)	390.86 (36)
High	582.75 (21)	430.05 (13)	524.37 (34)
$\bar{X}$	515.15 (35)	396.26 (35)	70

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT	1.640	.202
SVE +	2.484	.120
INTERP o	.371	.545
INTERACTION EFFECT	.237	.628
EXPLAINED VARIANCE	1.172	.327

SVE \ INTERP	Low	High	$\bar{X}$
Low	397.20 (15)	386.34 (21)	390.86 (36)
High	560.69 (20)	472.49 (14)	524.37 (34)
$\bar{X}$	490.62 (35)	420.80 (35)	70

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT	2.231	.115
SVE +	1.953	.167
INTERP o	1.494	.226
INTERACTION EFFECT	.456	.502
EXPLAINED VARIANCE	1.639	.189

SVE \ INTERP	Low	High	$\bar{X}$
Low	418.51 (14)	373.27 (22)	390.86 (36)
High	582.75 (21)	430.05 (13)	524.37 (34)
$\bar{X}$	517.05 (35)	394.36 (35)	70

+ Shared Views End
o Interpretation

TABLE 5.B1t

(UNWEIGHTED)

	F VALUE	SIGNIFICANCE
MAIN EFFECT VDEND + INTERP ○	1.920 1.376 3.047	.155 .245 .086
INTERACTION EFFECT	4.700	.034
EXPLAINED VARIANCE	2.846	.045

VDEND / INTERP	Low	High	$\bar{X}$
Low	564.35 (19)	249.61 (14)	430.83 (33)
High	479.52 (13)	517.77 (19)	502.23 (32)
$\bar{X}$	529.89 (32)	404.01 (33)	65

(WEIGHTED BY 'INFLUENCE GROUP')

	F VALUE	SIGNIFICANCE
MAIN EFFECT VDEND + INTERP ○	2.237 1.197 3.679	.115 .278 .060
INTERACTION EFFECT	4.360	.041
EXPLAINED VARIANCE	2.945	.040

VDEND / INTERP	Low	High	$\bar{X}$
Low	575.99 (18)	256.63 (15)	430.83 (33)
High	492.70 (14)	509.64 (18)	502.23 (32)
$\bar{X}$	539.55 (32)	394.63 (33)	65

(WEIGHTED BY INVOLVEMENT)

	F VALUE	SIGNIFICANCE
MAIN EFFECT VDEND + INTERP ○	1.057 .853 1.356	.354 .359 .249
INTERACTION EFFECT	3.429	.069
EXPLAINED VARIANCE	1.848	.148

VDEND / INTERP	Low	High	$\bar{X}$
Low	549.64 (17)	304.59 (16)	430.83 (33)
High	470.88 (15)	529.89 (17)	502.23 (32)
$\bar{X}$	512.72 (32)	420.65 (35)	65

(WEIGHTED BY 'INFLUENCE ME')

	F VALUE	SIGNIFICANCE
MAIN EFFECT VDEND + INTERP ○	1.771 1.037 2.742	.179 .313 .103
INTERACTION EFFECT	5.575	.021
EXPLAINED VARIANCE	3.039	.036

VDEND / INTERP	Low	High	$\bar{X}$
Low	575.99 (18)	256.63 (15)	430.83 (33)
High	470.88 (15)	529.89 (17)	502.23 (32)
$\bar{X}$	528.22 (33)	401.80 (32)	65

+ View Divergence (end) - Cause Map & Rank
○ Interpretation

The following section highlights the results from the analysis of all groups, regardless of their start position. The analysis begins with an analysis of the relationship between view divergence (a sub-dimension of interpretation), integration and performance.

Performance - All Groups

View Divergence, Integration & Performance

The four measures of view divergence and the four measures of integration coupled with the four weighted and unweighted measures of influence and involvement yielded 64 combinations of results as shown in Table 5B.1.

Since the interval measures of view divergence and integration were reclassified into two groups with high and low levels, the weighted measures of influence and involvement did not have a strong impact on the reclassification of groups. Generally, only one or two of the seventy groups changed classification when weighted by influence or involvement.

Beginning with the overall significance of the anova analysis, it can be seen that *two of the four measures of integration: 1) view divergence at the end of the simulation (vdend); and 2) the self-report measures of shared views at the end (sve), yield few overall significant results. The process measure of integration (discuss) yields more significant findings, while the integration measure of support/understanding (supund)* *yields consistent significant findings for every combination of measures.*

In comparing the results obtained from two of the integration measures, support/understanding (supund) and discussion (discuss), *there is only a moderate difference in classification of groups as being high or low on support/understanding (supund) and high or low on discuss. Of the 70 groups classified, only 15 received different classifications on these two measures.* This is reflected in the high correlation of .73 between the two measures. However since discuss is a process measure and support/understanding (supund) is a measure of the product of the process, some difference is to be expected. The following analysis focuses on the integration measure of support/understanding (supund) since it is the strongest measure of integration.

In terms of main effects and interaction effects, it was hypothesized that there would be a main effect for the measure of integration as stated in hypothesis 1, no main effect for the measure of interpretation - view divergence, and an interaction effect between the two, as stated in hypothesis 2. Since the hypotheses are directional, .10 was used as the cut-off point for the integration main effect and interaction effect. For overall effects and main effects on interpretation the .05 level of significance was used as a cut-off.

The expected pattern of relationships was found for the four weighted and unweighted measures of view divergence on both rank and the cause map (vdbeg) as the measure of interpretation and support/understanding (supund) as the measure of integration.

Since view divergence on rank and the cause map (vdbeg) is a weighted measure combining view divergence on rank (vdrank) and the two measures of view divergence on the cause map (vdsig, vdstruc), it is interesting to look at the results of the two sub-dimensions. When view divergence on rank (vdrank) is examined on its own, the results indicate, for all weighted and unweighted measures, significant main effects for both view divergence on rank (vdrank) and support/understanding (supund) and no interaction effects. The main effects for view divergence on rank (vdrank) are contrary to what was hypothesized. The results indicate the higher the initial view divergence on rank the lower the performance regardless of the level of integration. When view divergence on the cause map (cause) is examined on its own, main effects are found for support/understanding (supund), but there are no interaction effects.

Further analysis of the difference in results between view divergence on both the rank and the cause map (vdbeg) and its sub-dimensions of view divergence on rank (vdrank) and view divergence on the cause map (cause), reveals some interesting differences in classification of groups on each of the measures. The classification of groups into high and low view divergence on both rank and the cause map (vdbeg), is most strongly influenced by view divergence on the cause map (cause) since it represents two of the three measures of the overall view divergence measures (vdbeg). Between the overall measure (vdbeg) and view divergence on the cause map (cause) there are only 8 of 70 groups classified differently. The difference in the eight cases arises from cases of view divergence on rank (vdrank) where there is extremely high or low view divergence. In Chapter V, it was stated that view divergence on rank and the two measures of the cause map may capture different types of diversity. In many cases, the level of diversity on the cause map is consistent with the level of diversity on rank. However, in cases of conflict, when the level of diversity on rank is extreme, it acts as a counter-level of influence on view divergence on the cause map when the two are combined to form the overall measure of view divergence (vdbeg).

In summary, the measure of integration, support/understanding (supund), yields consistently significant overall results when associated with all weighted and unweighted measures of view divergence. The expected pattern of relationships between the measure of interpretation, integration and performance was identified with the overall measure of view divergence (vdbeg) as the measure of interpretation and support/understanding (supund) as the measure of integration. The overall measure of view divergence (vdbeg) seems to capture different types of diversity given its sub-dimensions of view divergence on rank (vdrank) and view divergence on the cause map (cause).

The foregoing discussion of the relationship between view divergence, integration and performance has focused on one dimension of interpretation - view divergence. The following section focuses on the second dimension of interpretation - schema complexity, and its relationship with integration and performance.

Schema Complexity, Integration & Performance

As with view divergence, an analysis of variance of the weighted and unweighted measures of complexity (comp), the four measures of integration (supund, discuss, sve, vdend) and performance, yielded the strongest results with support/understanding (supund). The overall effects for the other three measures were not significant. However, for support/understanding (supund) the significant effects could be attributed to the relationship between support/understanding (supund) and performance, since there were no significant interaction effects, nor any significant main effects for schema complexity (comp).

Interpretation, Integration & Performance

When the overall measure of view divergence (vdend) and the measure of schema complexity (comp) were combined to generate an overall measure of interpretation (interp), the cxpected pattern of relationships was found when discussion (discuss) was the measure of integration. For support/understanding (supund), there were the expected main effects but no interaction effects.

Integration & Performance

The four measures of integration: 1) support/understanding (supund); 2) discussion (discuss); 3) the self-report measure of the degree to which respondents shared views at the end of the simulation (sve); and 4) the combined measure of view divergence on rank and the cause map at the end of the simulation (vdend), have been discussed in the context of the measures of interpretation. To summarize the results, support/understanding (supund) yielded the strongest results with respect to the combination of main effects and interaction effects. *Both support/understanding (supund) and discussion (discuss) yielded significant main effects with every weighted and unweighted measure of view divergence, schema complexity and the combined measure of interpretation.*

Summary

The analysis of variance of the various measures of view divergence, schema complexity, the combined measure of interpretation, integration and performance yielded a range of results. The measure of schema complexity yielded no significant results. The overall measure of view divergence (vdbeg) when combined with the integration measure support/understanding (supund), generated significant interaction effects as was expected. The measures of integration, support/understanding (supund) and discussion (discuss), yielded significant main effects for all measures of view divergence, schema complexity and the combined measure of interpretation.

The foregoing section has presented the results from the analysis of variance of all groups regardless of their start position in the simulation. Since the analysis of the performance measure (cnmc), indicated differences in performance by start position, the following analysis will separate the groups into favoured and unfavoured start positions to determine whether start position interacts with any of the measures of interpretation or integration.

Favoured and Unfavoured Groups

In Chapter V, the analysis of variance of start position with performance indicated that groups starting in positions 2 and 4 were favoured. Therefore, group start position was recoded to show groups 1, 3, and 5 with the unfavoured start position coded 1, and groups 2 and 4 with the favoured start position coded 2. The following section presents the results from that analysis.

A three-way analysis of variance was conducted to determine whether group start position (gp) interacted with any of the measures of interpretation or integration. The significance of the two-way and three-way interactions of that analysis are summarized in Table 5B.2

TABLE 5B.2 - ANOVA: TWO & THREE-WAY INTERACTIONS WITH GROUP

INTERP-RETATION (A)	INTEG-RATION (B)	GROUPS (C)	RESULTS Inter-action AB	BC	AC	ABC
VIEW DIVERGENCE						
VDBEG	SUPUND	TWO GROUPS	.101*	.955	.887	.172
GVDBEG	SUPUND	TWO GROUPS	.199	.826	.846	.166
MVDBEG	SUPUND	TWO GROUPS	.101*	.905	.887	.172
VVDBEG	SUPUND	TWO GROUPS	.145	.941	.713	.250
VDBEG	DISCUSS	TWO GROUPS	.108*	.762	.947	.257
GVDBEG	DISCUSS	TWO GROUPS	.222	.778	.817	.298
MVDBEG	DISCUSS	TWO GROUPS	.108*	.762	.947	.257
VVDBEG	DISCUSS	TWO GROUPS	.138	.741	.782	.333
VDBEG	SVE	TWO GROUPS	.104*	.272	.696	.723
GVDBEG	SVE	TWO GROUPS	.050*	.204	.497	.491
MVDBEG	SVE	TWO GROUPS	.104*	.272	.696	.723
VVDBEG	SVE	TWO GROUPS	.067*	.241	.879	.554
VDBEG	VDEND	TWO GROUPS	.500	.281	.410	.031*
GVDBEG	VDEND	TWO GROUPS	.561	.235	.267	.019*
MVDBEG	VDEND	TWO GROUPS	.500	.281	.410	.031*
VVDBEG	VDEND	TWO GROUPS	.167	.229	.498	.370
VDRANK						
VDRNK	SUPUND	TWO GROUPS	.131	.824	.739	.231
GVDRNK	SUPUND	TWO GROUPS	.706	.970	.101	.518
MVDRNK	SUPUND	TWO GROUPS	.452	.943	.161	.714
VVDRNK	SUPUND	TWO GROUPS	.308	.858	.298	.512
VDRNK	DISCUSS	TWO GROUPS	.335	.943	.879	.525
GVDRNK	DISCUSS	TWO GROUPS	.552	.863	.090	.715
MVDRNK	DISCUSS	TWO GROUPS	.510	.825	.169	.744
VVDRNK	DISCUSS	TWO GROUPS	.422	.990	.366	.991
VDRNK	SVE	TWO GROUPS	.597	.209	.759	.700
GVDRNK	SVE	TWO GROUPS	.133	.092	.146	.162
MVDRNK	SVE	TWO GROUPS	.138	.077	.330	.151
VVDRNK	SVE	TWO GROUPS	.432	.173	.609	.218
VDRNK	VDEND	TWO GROUPS	.385	.275	.926	.214
GVDRNK	VDEND	TWO GROUPS	.549	.493	.100	.022*
MVDRNK	VDEND	TWO GROUPS	.907	.412	.207	.007*
VVDRNK	VDEND	TWO GROUPS	.922	.299	.430	.075

TABLE 5B.2 continued

INTERP-RETATION (A)	INTEG-RATION (B)	GROUPS (C)	RESULTS Significance of Interactions			
CAUSE			AB	BC	AC	ABC
CAUSE	SUPUND	TWO GROUPS	.748	.869	.970	.061
GCAUSE	SUPUND	TWO GROUPS	.748	.869	.970	.061
MCAUSE	SUPUND	TWO GROUPS	.748	.869	.970	.061
VCAUSE	SUPUND	TWO GROUPS	.681	.856	.890	.030*
CAUSE	DISCUSS	TWO GROUPS	.713	.782	.963	.173
GCAUSE	DISCUSS	TWO GROUPS	.713	.782	.963	.173
MCAUSE	DISCUSS	TWO GROUPS	.713	.782	.963	.173
VCAUSE	DISCUSS	TWO GROUPS	.409	.737	.988	.162
CAUSE	SVE	TWO GROUPS	.024*	.154	.840	.753
GCAUSE	SVE	TWO GROUPS	.024*	.154	.840	.753
MCAUSE	SVE	TWO GROUPS	.024*	.154	.840	.753
VCAUSE	SVE	TWO GROUPS	.091*	.212	.734	.862
CAUSE	VDEND	TWO GROUPS	.892	.420	.721	.064
GCAUSE	VDEND	TWO GROUPS	.892	.420	.721	.064
MCAUSE	VDEND	TWO GROUPS	.892	.420	.721	.064
VCAUSE	VDEND	TWO GROUPS	.699	.245	.469	.252

COMP			AB	BC	AC	ABC
COMP	SUPUND	TWO GROUPS	.646	.798	.875	.096
GCOMP	SUPUND	TWO GROUPS	.550	.794	.973	.120
MCOMP	SUPUND	TWO GROUPS	.871	.796	.634	.209
VCOMP	SUPUND	TWO GROUPS	.550	.794	.973	.120
COMP	DISCUSS	TWO GROUPS	.972	.602	.605	.261
GCOMP	DISCUSS	TWO GROUPS	.923	.604	.688	.306
MCOMP	DISCUSS	TWO GROUPS	.859	.681	.930	.552
VCOMP	DISCUSS	TWO GROUPS	.923	.604	.688	.306
COMP	SVE	TWO GROUPS	.405	.474	.524	.373
GCOMP	SVE	TWO GROUPS	.477	.468	.589	.426
MCOMP	SVE	TWO GROUPS	.254	.323	.959	.822
VCOMP	SVE	TWO GROUPS	.477	.468	.589	.426
COMP	VDEND	TWO GROUPS	.635	.238	.352	.837
GCOMP	VDEND	TWO GROUPS	.619	.239	.435	.822
MCOMP	VDEND	TWO GROUPS	.963	.404	.892	.327
VCOMP	VDEND	TWO GROUPS	.619	.239	.435	.822

TABLE 5B.2 continued

INTERP-RETATION (A)	INTEG-RATION (B)	GROUPS (C)		RESULTS Significance of Interactions		
INTERPRETATION						
INTERP	SUPUND	TWO GROUPS	.356	.816	.660	.082
GINTERP	SUPUND	TWO GROUPS	.350	.906	.639	.053*
MINTERP	SUPUND	TWO GROUPS	.321	.925	.671	.059
VINTERP	SUPUND	TWO GROUPS	.272	.895	.794	.029*
INTERP	DISCUSS	TWO GROUPS	.445	.834	.747	.107
GINTERP	DISCUSS	TWO GROUPS	.434	.918	.727	.088
MINTERP	DISCUSS	TWO GROUPS	.401	.941	.751	.096
VINTERP	DISCUSS	TWO GROUPS	.384	.818	.920	.045*
INTERP	SVE	TWO GROUPS	.125	.238	.871	.748
GINTERP	SVE	TWO GROUPS	.114	.200	.915	.684
MINTERP	SVE	TWO GROUPS	.129	.210	.954	.628
VINTERP	SVE	TWO GROUPS	.181	.248	.809	.980
INTERP	VDEND	TWO GROUPS	.813	.569	.897	.118
GINTERP	VDEND	TWO GROUPS	.887	.528	.891	.098
MINTERP	VDEND	TWO GROUPS	.747	.559	.973	.122
VINTERP	VDEND	TWO GROUPS	.906	.342	.652	.487
SVB	VDEND	TWO GROUPS	.763	.351	.910	.088
SVB	SUPUND	TWO GROUPS	.575	.748	.721	.581
SVB	DISCUSS	TWO GROUPS	.437	.680	.782	.306
SVB	SVE	TWO GROUPS	.133	.288	.490	.183

Table 5B.2 shows that there are no significant two-way interactions between group and any of the measures of interpretation or integration. However, 9 of the 84 combinations show significant three-way interactions. Of the nine significant three-way interactions, five can be attributed to the weighted measures of influence and involvement. The significant three-way interactions indicate that in the nine cases, the group variable should not be simply treated as a covariate. Further examination of the relationship between the measures of interpretation, integration and performance for both the favoured and unfavoured groups is required.

In addition to the nine significant three-way interactions, there are 22 three-way interactions with a significance level of less than .20. Although the interactions are not significant, a conservative approach, treating them as being close to significant was adopted. The conservative approach calls for further examination of these relationships as outlined above. For the remaining 51 relationships, group can be treated as a covariate since it does not demonstrate any two-way or three-way interactions with the measures of interpretation and integration.

Further examination of the significant three-way interactions was undertaken by comparing a two-way analysis of variance for the favoured and unfavoured groups. In the case of the overall measure of view divergence (vdbeg) and the measure of integration - support/understanding (supund), the analysis revealed that for the 42 unfavoured groups, there was a strong main effect for support/understanding (supund) as expected, but no interaction effect. Whereas for the 28 favoured groups the main effect for support/understanding (supund) was much weaker, but there was an interaction effect between the overall measure of view divergence (vdbeg) and support/understanding (supund) as expected.

For view divergence on the cause map (cause) and the measure of integration - support/understanding (supund) there was no interaction effect for each of the two groups. However, the strong main effect for support/understanding (supund) exhibited for the unfavoured groups was again much weaker for the favoured groups. The interaction effect was strongest for the favoured groups when divergence on the cause map was weighted by involvement (vcause).

A similar pattern was exhibited for the measure of schema complexity, (comp) and support/understanding (supund), and for the overall measure of interpretation (interp) and support/understanding (supund). The main effect for support/understanding (supund) found in the unfavoured groups diminished in the favoured groups, while the interaction effect became stronger.

For the overall measure of interpretation (interp) and the process measure of integration, discuss, two-way interactions that were not significant at .60 for the unfavoured groups became significant at .075 for the favoured groups.

For the combination of measures view divergence on rank (vdrank) and the self-report measure of shared views at the end of the simulation (sve), the unfavoured groups showed strong main effects for the measure of integration (sve), no main effects for view divergence on rank (vdrank), and no interaction effects between the two. The favoured groups however, showed the reverse pattern, no main effects for the measure of integration (sve), main effects for view divergence on rank (vdrank) and interaction effects between the two.

APPENDIX 5C - FREQUENCY OF SCHEMA TYPES

Although it was hypothesized that groups with a high level of potential interpretation and integration, that is groups with a productive schema, would perform better, hypothesis 2A stated that since it would be relatively easy to integrate a low level of diversity and conversely more difficult to integrate a high level of diversity, it was expected that there would be more Groupthink groups than Impoverished groups and more Contentious groups than Productive groups. Therefore, a chi-square analysis was conducted to determine whether there was a significant difference in the number of groups represented by the four types of schema. The results of the chi-square analysis are summarized in Table 5C.1.

For the overall measure of view divergence (vdbeg) as the measure of interpretation, there was a definite pattern in the number of groups found in each cell of the two by two matrix of high and low interpretation and integration. The typical pattern for the 70 groups was 22 groups with high interpretation and low integration as opposed to only 13 groups with both high interpretation and integration. Conversely, there were 21 groups with high integration and low interpretation as opposed to only 14 groups who were low on both interpretation and integration.

When the measure of interpretation, view divergence on rank alone (vdrank) was examined, the expected pattern disappeared. Instead, groups were very evenly distributed amongst the four cells. For view divergence on the cause map (cause), there were strong tendencies toward the pattern, except for the measure of integration - discuss. The degree to which individuals felt they shared views at the beginning (svb) showed the strongest evidence of the pattern with chi-squares ranging from 8.23 to 27.8. The chi-square of 27.8 is not surprizing given that it arises from the combination of the two self-report measures, of shared views at the beginning of the simulation (svb) and shared views at the end of the simulation (sve). For this combination there were 29 groups with a low level of shared views at the beginning and at the end as opposed to 6 groups with a low level of shared views at the beginning, but a high level at the end. In contrast, there were 28 groups with a high level of shared views at the beginning and the end, and only 7 groups with a low level of shared views at the beginning but a high level at the end.

For the second dimension of interpretation, schema complexity, the measure comp did not show the expected pattern when combined with two of the integration measures - support/understanding (supund) and discussion (discuss). For these combinations, the groups were evenly distributed amongst the cells. However, for the measures of integration: shared views at the end (sve) and view divergence on rank and the cause map at the end of the simulation (vdend), the pattern emerged, being very close to significant for the self report measure of shared views at the end of the simulation (sve) at .057.

When the two measures of interpretation: view divergence on rank and the cause map (vdbeg) and schema complexity (comp), were combined to form the overall measure of interpretation (interp) the pattern dissipated somewhat, except in the case of the integration measures of support/understanding (supund) and the self report measure of shared views at the end of the simulation (sve).

Overall, there were strong indications of the expected pattern for the overall measure of view divergence (vdbeg). There was some support for the measure of schema complexity (comp) when combined with the measure of integration (sve). When the two dimensions of interpretation, overall view divergence (vdbeg) and schema complexity (comp) were combined, the pattern largely dissipated. The strongest support arose from the measure of view divergence - shared views at the beginning (svb) which showed strong indications of the pattern with most of the measures of integration.

TABLE 5C.1 CHI-SQUARE ANALYSIS OF INTERPRETATION & INTEGRATION

INTERPRETATION	INTEGRATION	CHI-SQUARE	SIGNIFICANCE
VIEW DIVERGENCE			
VDBEG			
VDBEG	SUPUND	5.719	.0168*
GVDBEG	SUPUND	3.660	.0557
MVDBEG	SUPUND	5.719	.0168*
VVDBEG	SUPUND	5.719	.0168*
VDBEG	DISCUSS	2.059	.1513
GVDBEG	DISCUSS	.915	.3388
MVDBEG	DISCUSS	2.059	.1513
VVDBEG	DISCUSS	2.059	.1513
VDBEG	SVE	5.719	.0168*
GVDBEG	SVE	5.719	.0168*
MVDBEG	SVE	5.719	.0168*
VVDBEG	SVE	5.719	.0168*
VDBEG	VDEND	4.440	.0351*
GVDBEG	VDEND	2.595	.1072
MVDBEG	VDEND	4.440	.0351*
VVDBEG	VDEND	2.595	.1072
VDRANK			
VDRNK	SUPUND	.000	1.0000
GVDRNK	SUPUND	.229	.6324
MVDRNK	SUPUND	.229	.6324
VVDRNK	SUPUND	.229	.6324
VDRNK	DISCUSS	.229	.6324
GVDRNK	DISCUSS	.915	.3388
MVDRNK	DISCUSS	.229	.6324
VVDRNK	DISCUSS	.229	.6324
VDRNK	SVE	.229	.6324
GVDRNK	SVE	.915	.3388
MVDRNK	SVE	.229	.6324
VVDRNK	SVE	.229	.6324
VDRNK	VDEND	.140	.7083
GVDRNK	VDEND	.140	.7083
MVDRNK	VDEND	.140	.7083
VVDRNK	VDEND	.758	.3841

TABLE 5C.1 continued

INTERPRETATION SIGNIFICANCE	INTEGRATION	CHI-SQUARE	
VIEW DIVERGENCE			
CAUSE			
CAUSE	SUPUND	2.059	.1513
GCAUSE	SUPUND	2.059	.1513
MCAUSE	SUPUND	2.059	.1513
VCAUSE	SUPUND	.915	.3388
CAUSE	DISCUSS	.229	.6324
GCAUSE	DISCUSS	.229	.6324
MCAUSE	DISCUSS	.229	.6324
VCAUSE	DISCUSS	.229	.6324
CAUSE	SVE	2.059	.1513
GCAUSE	SVE	2.059	.1513
MCAUSE	SVE	2.059	.1513
VCAUSE	SVE	2.059	.1513
CAUSE	VDEND	1.243	.2650
GCAUSE	VDEND	1.243	.2650
MCAUSE	VDEND	1.243	.2650
VCAUSE	VDEND	1.243	.2650
SCHEMA COMPLEXITY			
COMP	SUPUND	.229	.6324
GCOMP	SUPUND	.229	.6324
MCOMP	SUPUND	.915	.3388
VCOMP	SUPUND	.229	.6324
COMP	DISCUSS	.000	1.0000
GCOMP	DISCUSS	.000	1.0000
MCOMP	DISCUSS	.000	1.0000
VCOMP	DISCUSS	.000	1.0000
COMP	SVE	3.660	.0557
GCOMP	SVE	3.660	.0557
MCOMP	SVE	3.660	.0557
VCOMP	SVE	3.660	.0557
COMP	VDEND	1.867	.1717
GCOMP	VDEND	.758	.3841
MCOMP	VDEND	1.243	.2650
VCOMP	VDEND	.758	.3841

TABLE 5C.1 continued

INTERPRETATION	INTEGRATION	CHI-SQUARE	SIGNIFICANCE
INTERPRETATION			
INTERP	SUPUND	5.719	.0168*
GINTERP	SUPUND	3.660	.0557
MINTERP	SUPUND	3.660	.0557
VINTERP	SUPUND	2.059	.1513
INTERP	DISCUSS	2.059	.1513
GINTERP	DISCUSS	.915	.3388
MINTERP	DISCUSS	.915	.3388
VINTERP	DISCUSS	.229	.6324
INTERP	SVE	5.719	.0168*
GINTERP	SVE	3.660	.0557
MINTERP	SVE	3.660	.0557
VINTERP	SVE	2.059	.1513
INTERP	VDEND	1.868	.1717
GINTERP	VDEND	.758	.3841
MINTERP	VDEND	.382	.5363
VINTERP	VDEND	.140	.7083
SVB	VDEND	.758	.3841
SVB	SUPUND	8.235	.0041*
SVB	DISCUSS	14.641	.0001*
SVB	SVE	27.680	.0000*

APPENDIX 5D -INDUSTRY PROFILES

There were 14 parallel industries in the simulation. Each industry consisted of five groups each with 20% market share. While each of the five groups began with different products in terms of characteristics and positioning within the segment, in each industry, group 1, for example, began with the same set of products. The analysis of variance of performance by industry presented in Chapter V indicated no significant difference in performance. However, an analysis of variance of performance by start position indicated that groups beginning in positions two and four had significantly higher performance that groups beginning in positions one three and five, suggesting that positions two and four were favourable start positions while positions one, three and five were unfavourable start positions.

Profiles of eight of the fourteen industries were obtained from the video-tape of the final presentations made by the groups. Six of the industries were not video-taped. The following are the profiles of the eight industries.

Industry 1 was dominated by group 4 with cumulative net marketing contribution measured in millions of dollars (cnmc) of 1024.1. Their nearest competitor had cnmc of 431.2. Group 4's gains were made early in the simulation at a time when the other four groups made some costly mistakes. By period four they were difficult to catch. As one group stated, "the leader's advertising budget alone was greater than our entire budget".

Industry 2 was dominated by group 2 with cnmc of 1235.8. Their nearest competitor had cnmc of 661.3. It is interesting to note that while the top performing group was classified as having a Productive schema, the remaining four groups were all classified as Contentious. It may be that the frustration and anxiety of dealing with such a formidable competitor made it difficult to achieve integration.

Industry 3 was also dominated by one group. Group 2, classified as having a Productive schema, had cnmc of 911.2. Of the remaining four groups, two were Contentious and two were classified as Groupthink. It is interesting to note that only one of the five groups commented on group process to any degree during their final presentation. The comments were made by one of the Contentious groups.

Industry 4 had an interesting composition. Groups 2 and 4 battled for top position with group 4 having the second highest performance of all 70 groups. Both groups 2 and 4 were classified as having Groupthink schemas. Groups 1 and 3 were two of the five lowest performing groups of the entire 70 groups, with both classified as having Contentious schemas. Groups five, classified as having a Groupthink schema, also experienced mediocre performance next to the two high performers in their industry.

Industry 5 was a competitive industry with four groups within striking distance of each other. Group 4, with a Productive schema, had the highest performance. However they only achieved a cnmc of 817. Group 2, with an Impoverished schema had a cnmc of 664 while group 5 with a Contentious schema had a cnmc of 596. Group 3, also having an Impoverished schema had a cnmc of 498. Group 1, having a Contentious schema had the lowest performance, with a cnmc of 88.

In industry 6, group 2, having a Productive schema dominated the industry with a cnmc of 1073.1. Group 1, also having a Productive schema, vied with group 4, classified as having an Impoverished schema, for second place. The lowest performing group, group 3, had the sixth lowest performance of all seventy groups in the simulation. They were classified as having an Impoverished schema. Finally, group 5, having a Contentious schema, ranked fourth in their industry. Group 5 was video-taped for the entire simulation.

Industry 7 had two groups, group 3 and 4, vying for the top position. The two groups were both classified as having a Productive schema and both groups were video-taped for the entire decision making process. The two lowest performers in the industry, groups 1 and 2, were groups with Contentious schemas. Group 5, with somewhat better performance than groups 1 and 2, had a Productive schema.

Industry 8 was a very competitive industry with groups 2, 3 and 4 being Groupthink groups and groups 1 and 5 being Contentious groups. Groups 2 and 4 were virtually equal in performance, with group 2 having a cnmc of 724.5 and group 4 having a cnmc of 789.2. Group 1 ranked third with a cnmc of 323. Group 3 was fourth with a cnmc of 255.6 and group 5 fifth with a cnmc of 147.8. Unfortunately there was a malfunction in the video and only one of the five groups was captured on video for the final presentations.

APPENDIX 5E- GROUP PROFILES

The following profiles were developed from the video tape of the final presentations made by the groups. Usable video-tape was obtained for 36 of the 40 groups taped. A three digit code was used to identify each group.

IMPOVERISHED GROUPS

Group 113 had the lowest performance in their industry. They lost market share rapidly over the first four periods, from 14% in period 0 to 4% in period 3, at which point they recognized they needed to focus and become a niche player as indicated in the strategic planning form they handed in. They state on their planning form "In comparison to the other four firms in the industry we are a small player with limited resources (i.e. using advertising as an indication of relative budget sizes available) therefore we will focus very specifically on the two segments we are strongest in." In their presentation they remarked that "some competitors' advertising budgets were greater than our total budget". By adopting a focused strategy their market share climbed to 15% by period 7. Their market share decreased in period 8 when the group decided to allocate resources to enter the Vodite market.

Group 121's initial market share of 20% in period 0, declined steadily to 6% by period 8. Through periods 0 through 3 they tried to reposition their products. They indicated that tried to compensate for their problems in positioning products through R & D by using heavier advertising. In periods 4 through 7 they adopted what they referred to as a "multi-niche strategy" by entering new markets. They found that they diluted their sales force and advertising and subsequently lost focus and market share. In period 8 the group decided to rationalize its product line and focus its resources. In conveying what they had learned, they referred to the area of group dynamics, stating that:

> the group has to focus and work together...we came together, but we were focusing on each other instead of the market place. In the future we learned that you have to make sure that everyone is involved. You need to establish individual responsibilities and communicate. We set up in two separate rooms with two different computers and we found that all of the decision making that was made in one room got changed in the other and consequently our strategy reflected that lack of focus. You need to have superordinate goals and focus on the task instead of each other.

Group 323 had the lowest performance in their industry ranking 64th out of all 70 groups. Their final presentation suggested a radical change in strategy for the future, calling for focus and rationalization. Although they recognized they had expanded beyond their resource base, they did not discuss why this happened.

Group 324, beginning in a favourable start position, had the second highest performance in their industry but lagged far behind the industry leader with a cnmc of 592.8. In their presentation, they focused on their strengths, appearing very satisfied with their performance. They didn't seem to recognize that they could have performed much better. In the question period after the presentation, their competitors pressed the group on their inflated view of themselves with questions such as: "How did you lose market leadership in segment 1?" The group rationalized the loss of market share by responding that they had allocated their resources to a more profitable segment.

GROUPTHINK GROUPS

Group 114 had the highest performance in their industry. In their presentation they named their company "Dominance Inc." In their fourth period planning form they stated that part of their strategy was "to keep the competition wondering what our next move will be, going for overall dominance while being unpredictable, hopefully infuriating all of our competitors. Their mission statement was "infuriate all of our competitors". In their presentation they stated that they were inspired by the greed of Gordon Gecko in the movie "Wall Street" and by Sun Tzu's book "The Art of War". They presented a quote from Tzu's book:

> If the enemy is taking his ease, harass him; if quietly encamped, force him to move; if well supplied with food, starve him out. Appear at points that the enemy must haste to defend; march swiftly to places where you are not expected.

They attributed their success to the large stable of R&D projects they were able to draw on. They ran into problems in period's 6 & 7 when they failed to identify that some of their products were at the end of their product life cycle. However, given their dominance of the industry, they had substantial slack and were able to recover quickly.

Group 213 ranked fourth in their industry. Their market share declined from an initial position of 20% to 10% in period four. In period four they experienced a turnaround and by period eight, their market share had reached 30% Their poor performance restricted their budget forcing them to focus their efforts. They maintained a minimal sales force and low R&D. The group was organized along functional lines. In their presentation, they made no comments made about group process.

Group 215 ranked second in their industry with cnmc of 540. The group suggested that their early moves into new markets took advantage of the problems their competitors were having. They suggested that as a management group they were very comfortable with each other. They indicated that they had adopted a consensus decision-making style.

Group 222 was one of the five groups video-taped for the entire decision making process. They ranked second in their industry and were generally in head-to-head competition with group four. They stated that "consensus is very valuable but that it takes time...The advantage is that every member of the team understands a great deal about all of the products and markets".

Group 224 was the highest performer in their industry and the second highest performer out of the 70 groups. They began with 20% of the market and increased their market share to over 40% by the end of the simulation. They utilized R&D, anticipating movement in the segments to accurately target new product introductions.

Group 225, in their final presentation, had a great deal to tell future management on how to run the company, but little to say about why they had such poor performance. They quickly focused on the two major competitors with little regard for how they could have improved their own performance.

Group 312 was the second highest performance in their industry. Their strategy focused on the Sonite market after a failed attempt into the Vodite market. They indicated that they made some mistakes, but they did not discuss why.

Group 313 ranked fourth in their industry. Their strategy was to pursue product diversification. They made no comments in their presentation about group process.

CONTENTIOUS GROUPS

Group 115 chose to be the first to enter the Vodite market. They experienced early success which dropped off rapidly as their competitors entered the market. They recognized two weaknesses of their strategy: 1) relying on advertising rather than R&D to reposition products with high customer awareness and 2) moving into segments where they had no competitive advantage.

Group 123 was one of the groups video-taped for the entire decision making process. In their final presentation, they remarked that one of the key learning points from the simulation was obtaining group consensus. Although they felt the physical environment of the conference room with blackboards helped to focus their ideas, they still reported that they had difficulty integrating everyone's ideas.

Group 124's strategy was to take advantage of opportunities in the market as they arose which required a lot of flexibility. The flexibility was achieved through having a variety of products in R&D. However, the group also recognized the cost of maintaining flexibility and its drain on resources, and therefore focused on the successful products that helped achieve opportunities. In the end, they stated that they ended up chasing segments by trying to reposition products with advertising and lower prices rather than vaulting their products to new positions with R&D. They stated that their impatience led them to focus on trying to obtain quick results through advertising rather than longer term results with R&D.

Group 124 began their final presentation by talking about the advantages and disadvantages of their decision making process. They adopted a brand management approach which created spirited rivalry between brands and enabled them to work through the voluminous data on a brand by brand basis. However, they found that it created conflicts of interest with too much negotiation. Since everyone had equal power, there was nobody to "draw the line" resulting in diluted decisions. One individual remarked that "in hindsight, I was very effective in getting budget for my product, which probably should have been dumped early on".

Group 211 had the lowest performance in their industry. Their contribution declined over the first two periods. By period three they had some success in positioning their products and their contribution increased dramatically. However, in period 6 they experienced a corresponding dramatic decrease in contribution as the market shifted but they were unable to track it. During their presentation of what they had learned in the simulation, they suggested that it is important to keep your analysis simple in order to be able to convey it to group members and have them buy into it. They cited the importance of trying to achieve consensus. The group found that when analysis was done in isolation it was easy for people to pick holes in the analysis. They also stated that they had difficulty coordinating marketing decisions over the various functional areas. But above all, they suggested that you need to be able to document and discuss your mistakes in order to learn from them. They stated that "although we made mistakes, we never made the same mistake twice".

Group 213 had the second lowest performance in their industry and ranked 65th out of the seventy groups overall. They indicated that they were not happy with the initial position of their products and tried to reposition them with advertising and distribution. They concentrated solely on the Sonite market but indicated that they should have focused their efforts even further. In their presentation they indicated that they worked well together, yet they individually reported difficulty in integrating ideas. Although they repeatedly remarked that "we didn't recognize" this or that, they did not address why this occurred. They implied that it was their management structure given their suggestion that future management should adopt a brand management approach to focus their thinking and reduce errors.

Group 214, having started in a favourable start position, had very poor performance. They had a broad based strategy, targeting many markets. However, they recognized their difficulties in being able to track changes in the market. Despite the fact the group realized they had made many "foolish mistakes", they did not suggest anything about group dynamics that contributed to their blunders.

Group 221 had the lowest performance in their industry and the lowest performance of the 70 companies in the simulation. Their strategy was to concentrate on the Vodite market. They recognized that they had difficulties repositioning products, particularly since they relied primarily on advertising rather than R&D. They indicated that they made some obvious mistakes but did not comment on why they had made them.

Group 311 had the lowest performance in their industry, having the ninth lowest cnmc of the 70 groups. In their presentation, they advised future management on the strategy they should adopt, but did not reflect on why they had done so badly. The only comment they made was that "we still haven't learned the lesson of being focused".

Group 315 were competitive in their industry with a cnmc of 596. They gained most of their contribution in the Vodite market in which they were the dominant competitor. They remarked that their positioned was strengthened when two of their competitors decided to drop out of the market. They felt that they had not done very well in the Sonite market since they always seem to lag behind their competition. They gave no indication why this occurred.

Group 411 had the lowest performance in their industry which they attributed to making some bad decisions early in the simulation which put them at a disadvantage.

Group 412 adopted a very high risk strategy which they described as "Go Vodite, Go Big". They recognized their favourable start position and decided that they could use the cash generated from their cash cows in the Sonite market to support their entry into the Vodite market. They stated that the people on the team were not satisfied with being number one in a shrinking market. They recognized they were taking a chance but they thought they could be extremely profitable in the long term. They cited several mistakes they made: they perceived the Sonite market as a declining market when in fact it was still growing; they perceived rapid growth in the Vodite market with a customer base who was not price sensitive; they expected the Vodite market to segment when in fact it didn't. At the end of the simulation, they had 60% share of the Vodite market, but they were still losing money. They concluded that:

> if you want to reach the highest of highs you have to risk being totally annihilated. And the down side is, that every once in a while, you will be annihilated.

Group 325 ranked fourth in their industry. They pointed to a number of errors they made, for example pricing below cost, but they didn't suggest why this happened. They concluded by saying "We started in a good position, so perhaps we didn't manipulate the products and look at our competitors as much as we should have. But now we've learned how this market works."

Group 421 ranked third in their industry. Their initial strategy was to be the market leader with a broad base of products. However, they found that they spread their resources too thinly. They had a failed attempt into the Vodite market, costing them over $10 million. Although they attributed the failure to having a high cost product, they did not discuss why they were not able to foresee the problems they would face in entering the Vodite market.

PRODUCTIVE GROUPS

Although group 111 was classified as a productive group, their final presentation made them appear more as a contentious group. For example in their discussion of learning experiences they cited: don't try to be everything to everybody and working as a team of equals is more effective than dividing responsibilities.

Group 112 adopted a follower strategy, entering into the Vodite market once it had been established. There performance was fairly stable over the course of the simulation. However, since the industry was dominated by one group, they found it difficult to make major inroads into the industry.

Group 122 had the highest performance in their industry and the highest performance of all 70 groups. Their strategy was to establish market leadership in segments desiring premium products. They did so using a limited product line with continuous product improvements through heavy R&D. They stated that:

> the most importance factor in our success was having a clear strategy and clear objectives which enabled us to focus the group effort and resolve dissention in the group. Although we analyzed the data separately by functional area we got together as a group to make decisions. It seemed a little disorganized, but using the strategy as a benchmark we would make decisions...It resulted in a structured, well balanced decision making process.

Group 212 had the highest performance in their industry. In terms of group dynamics, the group suggested that it is important to get everyone involved. They indicated that they had adopted a process that utilized brainstorming to generate options which were then evaluated and decided upon by consensus.

Group 314 had the highest performance in their industry. They indicated that they organized their group divisionally into the Sonite and Vodite divisions. They said they ran into difficulties when they were over budget and had to decide which division to allocate resources to. However, they indicated that it forced them to flesh out the alternatives and think about the consequences of their actions. They felt that their success could be attributed to good teamwork.

Group 321 ranked a close third in their industry, but was the second highest performing group of the 14 groups beginning in position one. Unfortunately the video tape of their final presentation was unusable.

Group 322 ranked first in their industry and fourth out of the entire 70 groups. Their strategy was to conduct R&D on their products to remain responsive to the market and target segments that provide the highest returns.

Group 413, having started in an unfavourable start position had a cnmc of 713.4, just short of the industry leader at 799.4. Even though they ranked second, their competition viewed them as the industry leader as a result of their explosive growth in the last few periods of the simulation. Their strategy was to be a low cost producer with fast turnaround on R&D projects to anticipate market needs.

Group 414 was the top performer in their industry. Their strategy was to be in as many segments as their resources allowed, and to conduct R&D to reduce product costs and to be responsive to customer needs. They maintained a presence in the Vodite market but did not pursue it aggressively. In periods 7 and 8, even though their budget increased, their net marketing contribution decreased. They admitted that in those periods they were clearly beaten by their competition who had better positioned products.

Group 415 ranked third in their industry. Their strategy was to focus on only two segments of the Sonite market. In the Vodite market they adopted a follower strategy. They made an unsuccessful attempt into the Vodite market in period 5, but withdrew because their costs were too high. They indicated that they learned the importance of focusing. They got sidetracked with the Vodite market, losing $12 million in the process. However, they suggested that you need to be flexible and change your strategy if it is not working. They felt their consensus decision making process facilitated their success.

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